MAINTENANCE MANUAL



RACAL-DANA

RACAL

The Electronics Group



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MAINTENANCE MANUAL

SERIES 6000 MICROPROCESSING DIGITAL MULTIMETER

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FOR YOUR SAFETY

Before undertaking any maintenance procedure, whether it be a specific troubleshooting or maintenance procedure described herein or an exploratory procedure aimed at determining whether there has been a malfunction, read the applicable section of this manual and note carefully the **WARNING** and **CAUTION** notices contained therein.

The equipment described in this manual contains voltage hazardous to human life and safety and which is capable of inflicting personal injury. The cautionary and warning notes are included in this manual to alert operator and maintenance personnel to the electrical hazards and thus prevent personal injury and damage to equipment.

If this instrument is to be powered from the AC line (mains) through an autotransformer (such as a Variac or equivalent) ensure that the common connector is connected to the neutral (earthed pole) of the power supply.

Before operating the unit ensure that the protective conductor (green wire) is connected to the ground (earth) protective conductor of the power outlet. Do not defeat the protective feature of the third protective conductor in the power cord by using a two conductor extension cord or a three-prong/two-prong adaptor.

Maintenance and calibration procedures contained in this manual sometimes call for operation of the unit with power applied and protective covers removed. Read the procedures carefully and heed Warnings to avoid "live" circuit points to ensure your personal safety.

Before operating this instrument:

1. Ensure that the instrument is configured to operate on the voltage available at the power source. See Installation Section.

2. Ensure that the proper fuse is in place in the instrument for the power source on which the instrument is to be operated.

3. Ensure that all other devices connected to or in proximity to this instrument are properly grounded or connected to the protective third-wire earth ground.

If at any time the instrument:

- Fails to operate satisfactorily
- Shows visible damage
- Has been stored under unfavorable conditions
- Has sustained stress

It should not be used until its performance has been checked by qualified personnel.

ERRATA SHEET

October 1986

The following Racal-Dana Model 6000 part numbers have new FSC numbers and/or new manufacturers part numbers:

Racal-Dana Part Number	FSC	Manu P/N
012098	91637	PTF56-T13
100017	56289	1C25Z5U103M100E
101145	56289	561CR3LBA102AF101J
110020	05397	T322D106K035AS
110125	05397	T355C225M035AS
110126	05397	T355F685M035AS
110127	05397	T355D226M006AS
110129	05397	T355A104M035AS
110137	05397	T355A474M035AS
110139	05397	T355A224M035AS
110140	05397	T355F476M006AS
110141	05397	T355F226M016AS
110151	05397	T354G106M035AS
110152	05397	T355B474K050AS
110158	05397	T354K106M050M
110165	05397	T355A154K035AS
110181	05397	T354K146M035AS
130124	52763	311609-241
130127	52763	300324-52D
210074	50434	HPQDSP-411S
210079	50434	HLMP-3401
600912	79727	GF-323-0070
920790	27556	PWS2142FL

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SECTION 5 THEORY OF OPERATION

5.1 INTRODUCTION.

5.1.1 This section presents the theory of operation for the Model 6000 Microprocessing Digital Multimeter (DMM). The operation is analyzed first in terms of a basic block diagram (Figure 5.1) and then operating modes and individual circuits are described. The drawings in this section are provided for use in conjunction with the descriptions and as supplements to the complete schematics located in Section 7.

5.2 BASIC OPERATION.

5.2.1 As may be seen in Figure 5.1, the Model 6000 is composed of three major sections: Analog Signal Conditioner, Digital Control and Interface (optional). Input signals are conditioned and digitized in the Analog Signal Conditioner. Circuit timing and control signals are developed by the microprocessor based logic in the Digital Control section. The Digital Control section also provides keyboard decoding and display logic.

5.2.2 The Model 6000 may also be used as part of an instrumentation system. Remote control of the DMM is achieved through the use of one of the optional interface modules. As can be seen in Figure 5.1, the Interface acts as a bi-directional port for data and control signals generated by the Digital Control section and the external System Controller.

5.3 ANALOG SIGNAL CONDITIONER.

5.3.1 The following paragraphs present a detailed analysis of the signal conditioning process. A block diagram of the Analog section may be found in Figure 5.2.

5.3.2 The Analog section of the basic Model 6000 contains the following plug-in boards:

- Digitizer (J6)
- Isolator (J7)
- Switching (J9)
- Ohms Bypass (J8)
- Preamplifier Bypass (J10)
- Attenuator/Reference (J301, J302, J308)

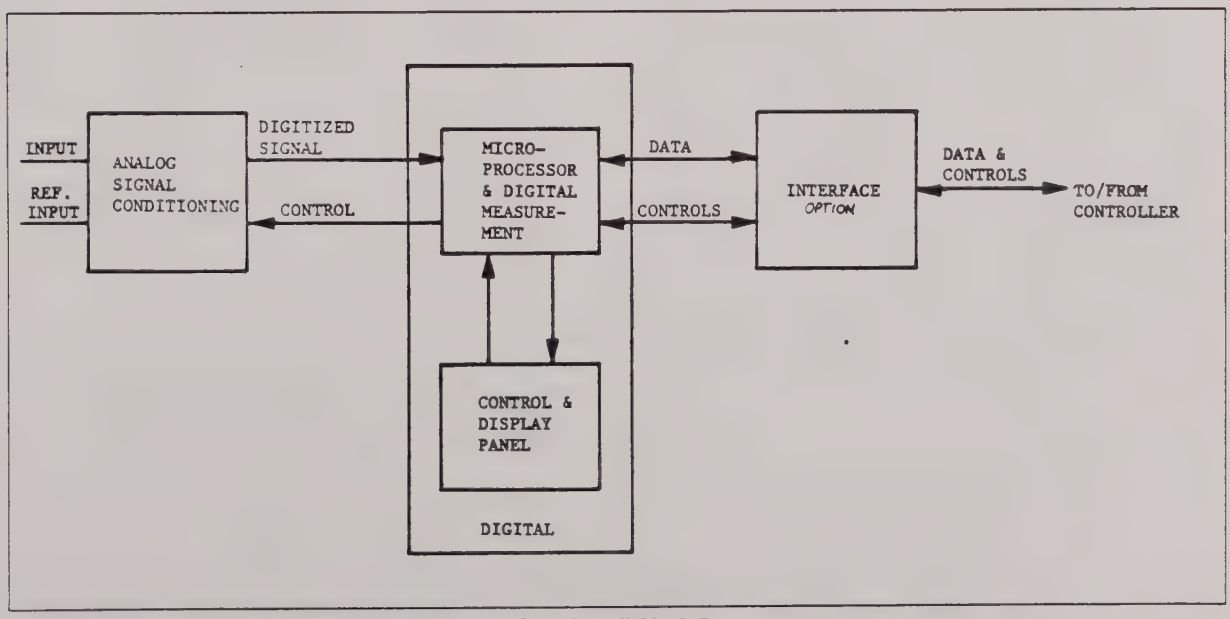
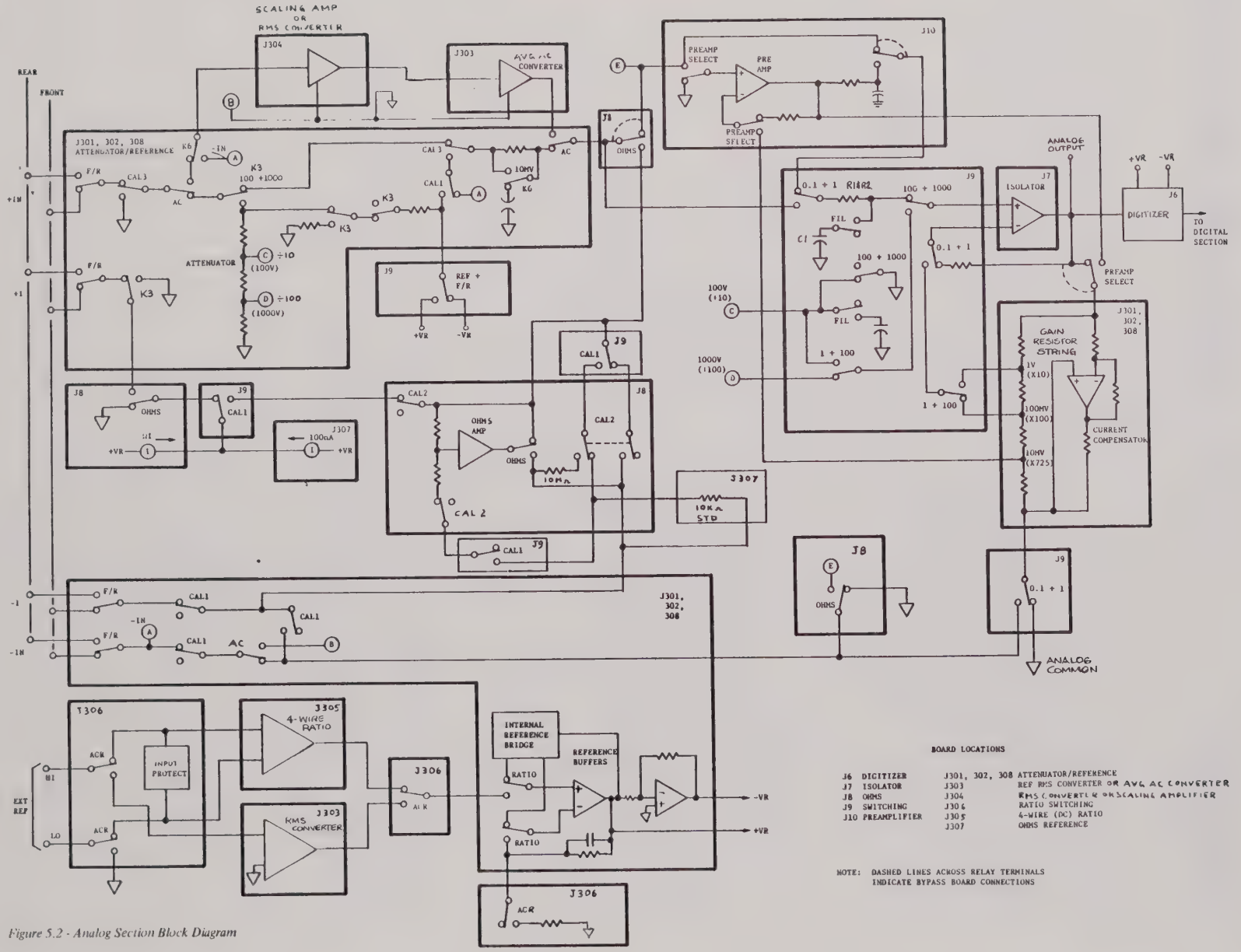


Figure 5.1 - Overall Block Diagram



BOARD LOCATIONS

J6	DIGITIZER	J301, 302, 308	ATTENUATOR/REFERENCE
J7	ISOLATOR	J303	REF RMS CONVERTER OR AVG AC CONVERTER
J8	OHMS	J304	RMS CONVERTER OR SCALING AMPLIFIER
J9	SWITCHING	J306	RATIO SWITCHING
J10	PREAMPLIFIER	J305	4-WIRE (DC) RATIO
		J307	OHMS REFERENCE

NOTE: DASHED LINES ACROSS RELAY TERMINALS INDICATE BYPASS BOARD CONNECTIONS

Figure 5.2 - Analog Section Block Diagram

5.3.3 The functional capabilities of the Analog section may be enhanced by the addition of the following optional plug-in boards:

- AC RMS Converter (J304)
- AC Averaging Converter and Scaling Amplifier (J303, J304)
- Ohms (Replaces Ohms Bypass) and Ohms Reference (J8, J307)
- Preamplifier (Replaces Preamplifier Bypass) (J10)
- Fast Waveform Digitizer (J5)
- Four Wire Ratio and Ratio Switching (For DC External Reference) (J305, J306)
- AC RMS Converter and Ratio Switching (For AC External Reference) (J303, J306)

NOTE

The AC External Reference option cannot be installed in an instrument containing an AC Averaging Converter.

5.3.3.1 For the convenience of the user during maintenance or field installation of options, the Model 6000 has an option label affixed to the transformer cover on the rear panel. It indicates the location of all option assemblies for that unit.

Option	Function	Location of Unique Assy
—	AC rms	Cal Module
—	488 Interface	Mainframe
—	Ohms	Cal Mod./Mainfr.
03SH	H.S. Digitizer	Mainframe
04	50 Hz line	Mainframe
09	Ratio Switch	Cal Module
11	Ref AC rms	Cal Module
14	AC avg	Cal Module
34	4W Ratio	Cal Module
41	10mV/1Ω	Mainframe
59	BCD Interface	Mainframe
60	Rack Mount	Mainframe
66	Slide Mount	Mainframe
71	220/240 line	Mainframe

5.3.4 Measurement Modes.

5.3.4.1 The Model 6000 (with the appropriate options) is capable of measuring DC voltage, AC voltage and resistance. The DMM is also capable of accepting external references in the measurement process, ratio measurements and automatic self-calibration.

5.3.4.2 The route a measurement signal follows through the analog section depends on the functions and ranges selected. Functions and ranges are selected by either the use of the front panel controls or by external commands received at the interface. Signal flow diagrams in Section 6 show the routing of measurement signals for different functions and ranges of the DMM.

NOTE

Inputs may be applied to the front panel and/or rear panel input terminals. Selection of the input(s) for measurement is made by either the use of the front panel controls or by external commands received at the interface.

5.3.4.3 DC VOLTAGE MEASUREMENT.

5.3.4.3.1 The basic Model 6000 is capable of measuring DC voltage in five ranges: 100 mV, 1V, 10V, 100V and 1000V. A 10 mV range is also available when the instrument is equipped with a Preamplifier (Option 41).

5.3.4.3.2 DC signal inputs may be traced from the selected +IN terminal through contacts of the F/R (Front/Rear), Cal 3 and AC relays (reference Figure 5.2). The path from the selected –IN terminal is routed through contacts of the F/R, Cal 1 and AC relays. Signal routing beyond these points is dependent upon range selection.

5.3.4.3.3 *10 Volt Range.* The signal from the +IN terminal is routed through the contacts of the 100+1000, Ohms, Preamp Select, .1+1 and 100+1000 relays to the positive input of the Isolator. The Isolator output is fed back directly to the negative input (through the normally closed contacts of the .1+1 relay) to obtain a closed loop gain of 1.0. The –IN terminal is connected to analog common through contacts of the Ohms relay. A simplified block diagram is shown in Figure 5.3.

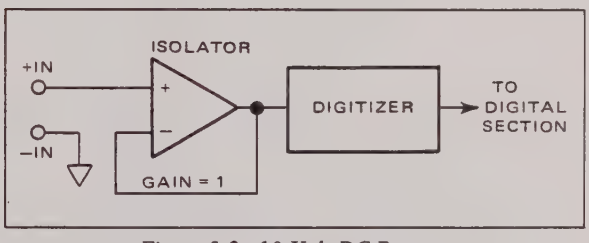


Figure 5.3 - 10 Volt DC Range

5.3.4.3.4 *1 Volt Range.* The signal from the +IN terminal is routed through the contacts of the .1+1 relay to the positive input of the Isolator. The Isolator output is applied to the Gain Resistor string through the normally closed contacts of the Preamp Select relay. A feedback signal from the Gain Resistor string is applied to the negative input of the Isolator (through the normally open contacts of the 1+100 and .1+1 relays) to obtain a closed loop gain of 10. The –IN terminal is connected to analog common through contacts of the Ohms relay, and to the lower end of the Gain Resistor string through contacts of the .1+1 relay. A simplified block diagram is shown in Figure 5.4.

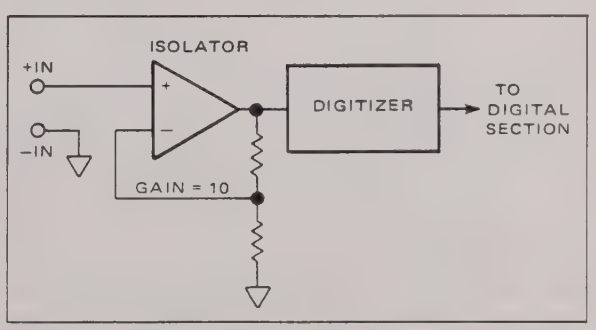


Figure 5.4 - 1 Volt DC Range

5.3.4.3.5 *100 Millivolt Range.* The signal from the +IN terminal is routed through the contacts of the .1+1 relay to the positive input of the Isolator. The Isolator output is applied to the Gain Resistor string through the normally closed contacts of the Preamp Select relay. A feedback signal from the Gain Resistor string is applied to the negative input of the Isolator (through the normally closed contacts of the 1+100 relay and the normally open contacts of the .1+1 relay) to obtain a closed loop gain of 100. The –IN terminal is connected to analog common through contacts of the Ohms relay, and to the lower end of the Gain Resistor string through contacts of the .1+1 relay. A simplified block diagram is shown in Figure 5.5.

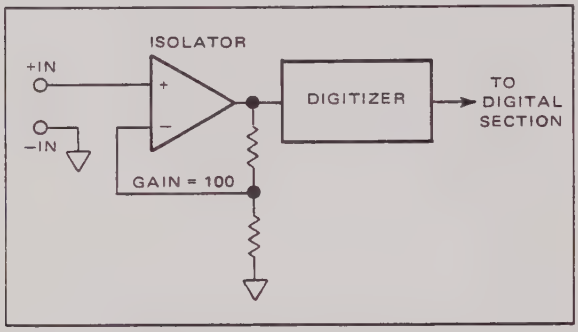


Figure 5.5 - 100 Millivolt DC Range

5.3.4.3.6 *100 and 1000 Volt Ranges.* The signal from the +IN terminal is routed through contacts of the Attenuator/Reference board 100+1000 relay to the attenuator. The attenuator scales down the input signal by a factor of 10 (100 volt range) or 100 (1000 volt range). The attenuated signal is routed through the contacts of the 1+100 and 100+1000 relays to the positive input of the Isolator. The Isolator output is fed back directly to the negative input (through the normally closed contacts of the .1+1 relay) to obtain a closed loop gain of 1.0. The –IN terminal is connected to analog common through contacts of the Ohms relay. A simplified block diagram is shown in Figure 5.6.

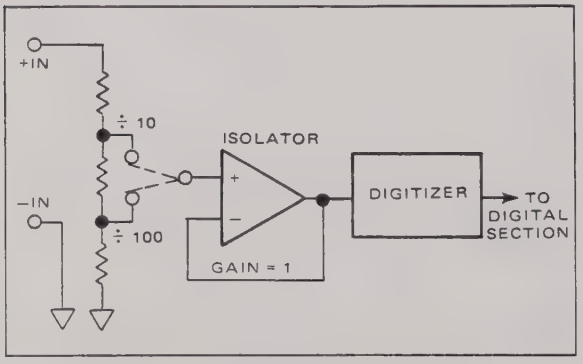


Figure 5.6 - 100 and 1000 Volt DC Ranges

5.3.4.3.7 *10 Millivolt Range (Option 41).* The signal from the +IN terminal is routed through the contacts of the 10 mV and Preamp Select relays to the positive input of the Preamplifier. The filtered output of the Preamplifier is fed through contacts of the Preamp Select and .1+1 relays to the positive input of the Isolator. The unfiltered output of the Preamplifier is fed through contacts of the Preamp Select relay to the Gain Resistor string. A feedback signal from the Gain Resistor string is applied to the negative input of the Preamplifier (through the contacts of the Preamp Select relay) to obtain a Preamplifier gain of 725. The Isolator output is fed back directly to the negative input (through the normally closed contacts of the .1+1 relay to obtain a closed loop gain of 1.0. The –IN terminal is connected to analog common through contacts of the Ohms relay. A simplified block diagram is shown in Figure 5.7.

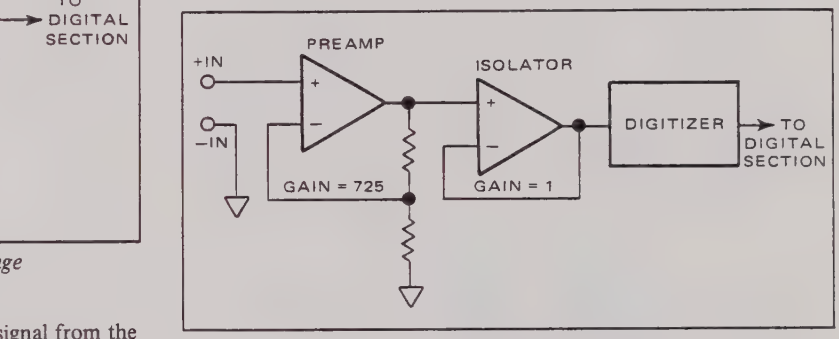


Figure 5.7 - 10 Millivolt DC Range

5.3.4.3.8 The full scale Isolator output of 7.25 volts (for a 10 mV input) is scaled by the Microprocessor to display a full scale reading. The scaling process allows for an overrange of 120% (22 mV input and 16 volt Isolator output).

5.3.4.4 AC VOLTAGE MEASUREMENT (OPTIONS 10 AND 14).

5.3.4.4.1 The Model 6000 (when equipped with Option 10 or Option 14) is capable of measuring AC voltage in four ranges: 1V, 10V, 100V and 1000V. Option 10 provides the DMM with a True RMS Converter. Option 14 provides the DMM with a Scaling Amplifier (J304) and an Averaging Converter (J303).

5.3.4.4.2 AC signal inputs may be traced from the selected +IN terminal through contacts of the F/R (Front/Rear), Cal 3, AC and K6 relays to the input of the AC Converter (Option 10 or Option 14). The output of the AC Converter is routed through contacts of the AC, .1+1 and 100+1000 relays to the positive input of the Isolator. The output of the AC Converter is 1.0 VDC full scale (independent of range selection) and the Isolator output is applied to the

Gain Resistor string for a closed loop gain of 10. The path from the –IN terminal is routed through contacts of the F/R, Cal 1 and AC relays to analog common. A simplified block diagram is shown in Figure 5.8.

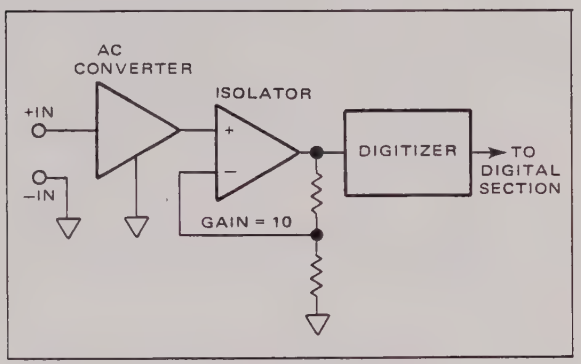


Figure 5.8 - AC Voltage Measurement

5.3.4.5 OHMS MEASUREMENT (OPTION 24).

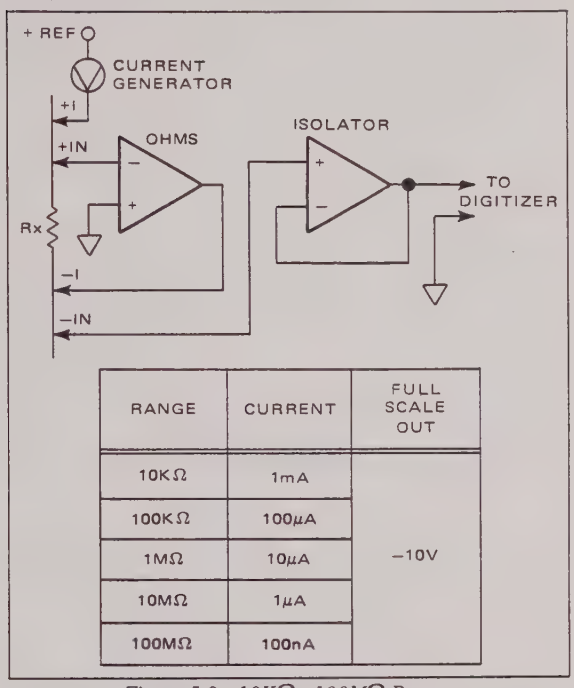
5.3.4.5.1 The Model 6000 (when equipped with Option 24) is capable of measuring resistance in eight ranges: 10Ω, 100Ω, 1KΩ, 10KΩ, 100KΩ, 1MΩ, 10MΩ, and 100MΩ. A 1Ω range is also available when the instrument is equipped with a Preamplifier (Option 41).

5.3.4.5.2 The circuit configuration is dependent upon the range selected and may take one of three forms. Figures 5.9 - 5.11 show simplified block diagrams of these configurations. In each of the configurations, a current reference is applied to the resistance being measured. This resistance is connected as the feedback path for the Ohms amplifier and the current through this resistance will equal the current provided by the current reference. The output of the Ohms amplifier is a negative DC voltage proportional to the resistance being measured.

5.3.4.5.3 *10KΩ - 100MΩ Ranges.* As shown in Figure 5.9, the output of the Ohms Amplifier is applied to the positive input of the Isolator. The Isolator has a closed loop gain of 1.0 in these ranges, and serves as a buffer between the Ohms amplifier and the Digitizer. The full scale output of the Ohms Amplifier and Isolator is –10 volts.

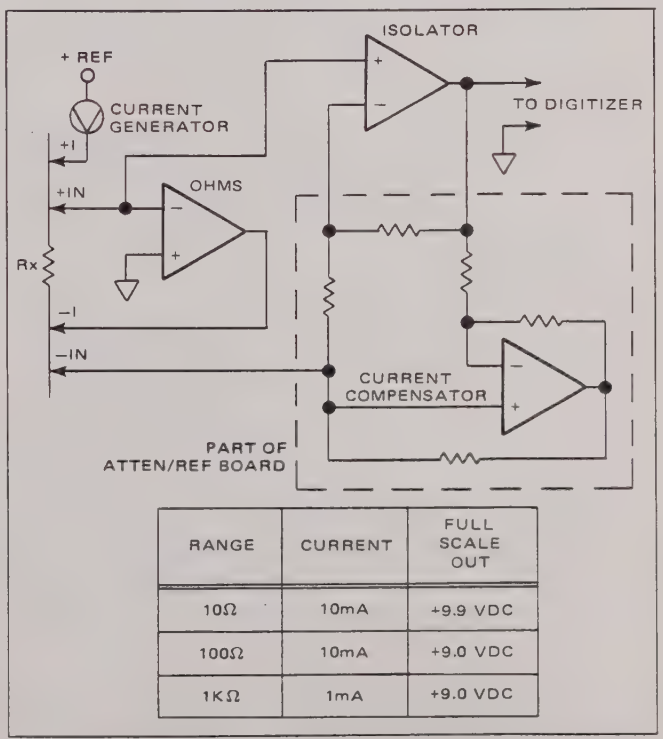
5.3.4.5.4 *10Ω - 1KΩ Ranges.* As shown in Figure 5.10, the output of the Ohms amplifier is applied to the positive input of the Current Compensator, and to the negative input of the Isolator (through part of the Gain Resistor string). The output of the Current Generator is applied to the positive input of the Isolator. In this configuration, the output of the Ohms amplifier is inverted and amplified by the Isolator for a full scale output as indicated in Figure 5.10. Isolator gain is 100 in the 10 ohm range and 10 in the 100 ohm and 1 Kohm ranges.

The Current Compensator keeps the current through the Gain Resistor string from flowing through the resistance being measured.



RANGE	CURRENT	FULL SCALE OUT
10KΩ	1mA	–10V
100KΩ	100μA	
1MΩ	10μA	
10MΩ	1μA	
100MΩ	100nA	

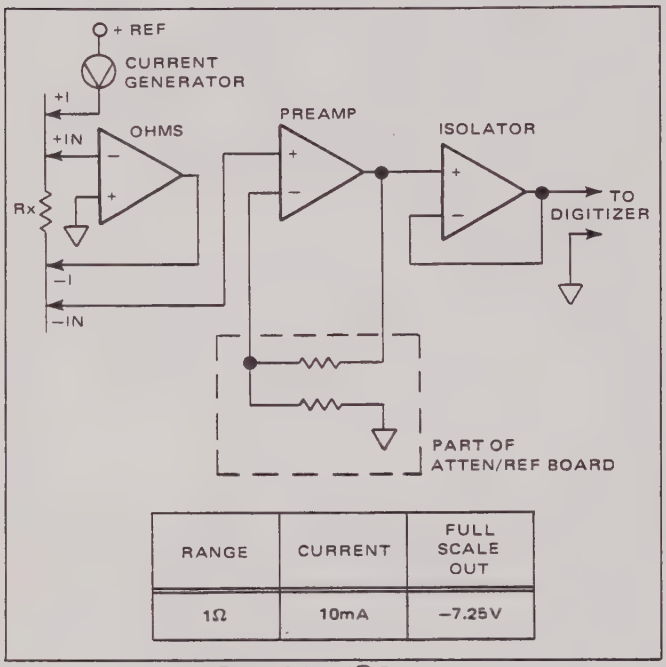
Figure 5.9 - 10KΩ - 100MΩ Ranges



RANGE	CURRENT	FULL SCALE OUT
10Ω	10mA	+9.9 VDC
100Ω	10mA	+9.0 VDC
1KΩ	1mA	+9.0 VDC

Figure 5.10 - 10Ω - 1KΩ Ranges

5.3.4.5.5 *1Ω Range (Option 41).* As shown in Figure 5.11, the output of the Ohms amplifier is applied to the positive input of the Preamplifier (Option 41). The Preamplifier provides a gain of 725 and the output is applied to the positive input of the Isolator. The Isolator has a closed loop gain of 1.0 and serves as a buffer between the Preamplifier and the Digitizer. The full scale output of the Preamplifier and Isolator is −7.25 volts.



RANGE	CURRENT	FULL SCALE OUT
1Ω	10mA	−7.25V

Figure 5.11 - 1Ω Range

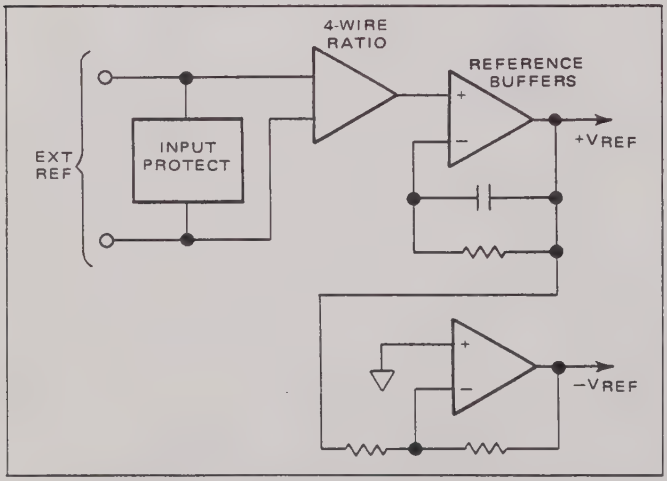


Figure 5.12 - External Reference (DC EXT REF)

5.3.4.6 EXTERNAL REFERENCES AND HARDWARE RATIO.

5.3.4.6.1 Hardware ratio measurements are performed by replacing the internal reference voltages with an external reference. The external reference voltage is applied to the EXT REF terminals and may be either AC (Option 11) or DC (Option 34). Signal voltages applied to the front or rear input terminals of the DMM are divided by the external reference voltage.

5.3.4.6.2 The Model 6000 will accept DC external reference voltages between +1.0 and +10.5 volts when DC EXT REF is selected. As shown in Figure 5.2, the external reference voltage is routed through the normally closed contacts of the ACR relay to the differential inputs of the 4-Wire Ratio amplifier. The 4-Wire Ratio amplifier acts as a buffer, and eliminates ground loop errors by permitting the reference voltage to float with respect to the input signal common. The output of the 4-Wire Ratio amplifier is routed through the normally closed contacts of the ACR relay and the normally open contacts of the Ratio relay to the input of the Reference Buffers. The Reference Buffers are unity gain amplifiers, and provide plus and minus reference voltages equal in magnitude to the external reference voltage. A simplified block diagram is shown in Figure 5.12.

5.3.4.6.3 External reference voltages from 0.1 to 1000 volts AC or DC can be used when AC EXT REF or DC coupled AC EXT REF is selected. The high side of the external reference voltage is routed through the normally open contacts of the ACR relay to the input of the RMS Converter. Note that the low side of the external reference voltage is connected to analog common through the ACR relay, thus the reference voltage does not float with respect to the input signal voltage. The RMS Converter scales and takes the true RMS value of the external reference voltage. The +1.0 volt full scale output of the RMS Converter is routed through the normally open contacts of the ACR and Ratio relays to the input of the Reference Buffers. The Reference Buffers are set for a gain of 10 to produce ± 10 volts DC full scale reference voltages. A simplified block diagram is shown in Figure 5.13.

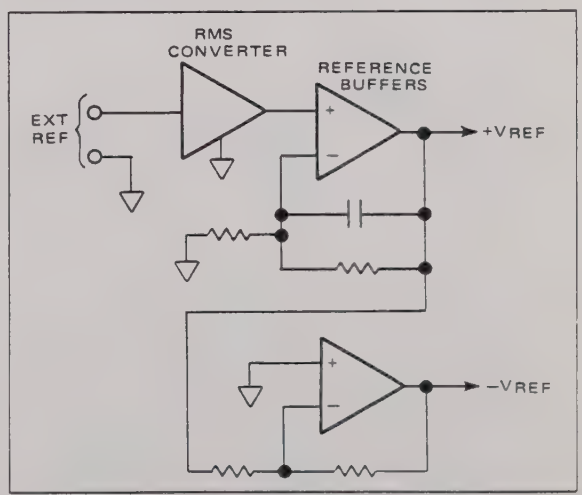
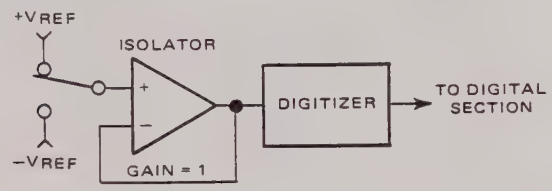


Figure 5.13 - External Reference (AC EXT REF)

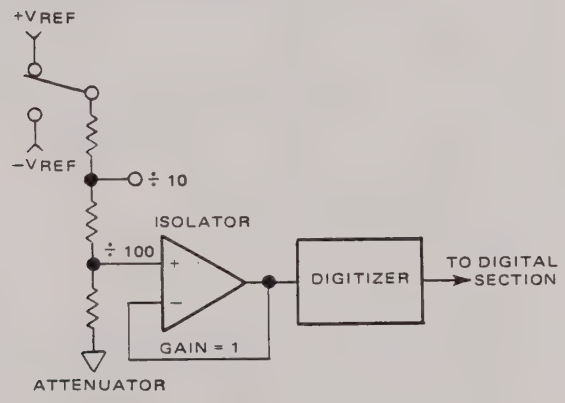
5.3.4.7 AUTO-CAL CONFIGURATIONS.

5.3.4.7.1 When the Auto-Cal routine is initiated, the Model 6000 sets the analog circuitry to various configurations, tests error factors against preset limits and, if the errors are within these limits, stores correction factors in memory. The basic Auto-Cal routine will perform seven DC test and calibration steps. The routine will also include five Ohms steps (if Option 24 is installed). One additional DC step and one additional Ohms step are performed when a Preamplifier (Option 41) is installed.

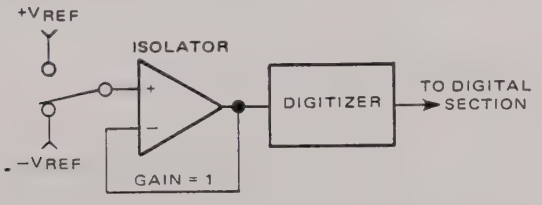
5.3.4.7.2 *DC CAL 1.* The Isolator/Digitizer configuration is calibrated with the positive reference voltage (see block diagram below).



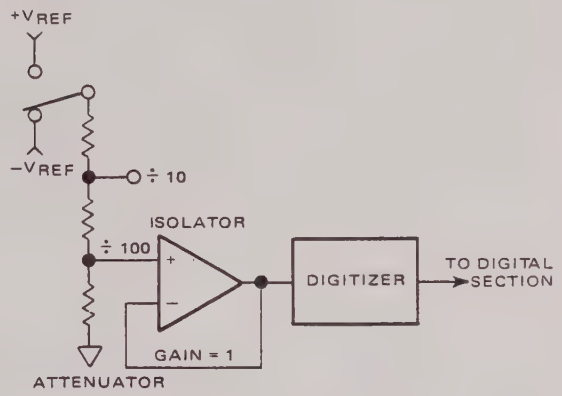
5.3.4.7.3 *DC CAL 2.* The Attenuator/Isolator/Digitizer configuration is calibrated with the positive reference voltage (see block diagram below).



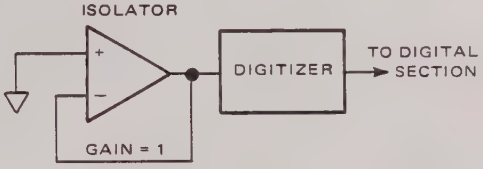
5.3.4.7.4 *DC CAL 3.* The Isolator/Digitizer configuration is calibrated with the negative reference voltage (see block diagram below).



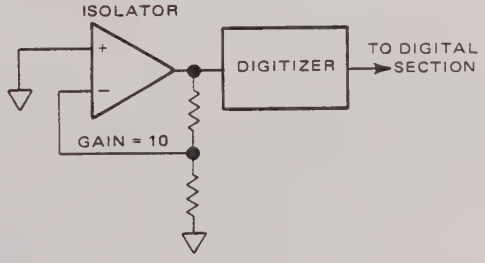
5.3.4.7.5 *DC CAL 4.* The Attenuator/Isolator/Digitizer configuration is calibrated with the negative reference voltage (see block diagram below).



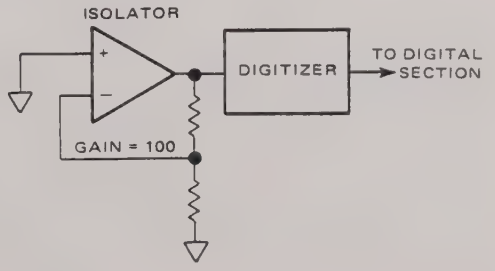
5.3.4.7.6 *DC CAL 5.* The offset of the Isolator/Digitizer configuration is measured in the 10 volt range (see block diagram below).



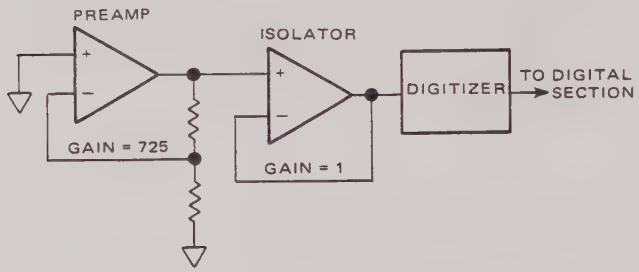
5.3.4.7.7 *DC CAL 6.* The offset of the Isolator/Digitizer configuration is measured in the 1 volt range (see block diagram below).



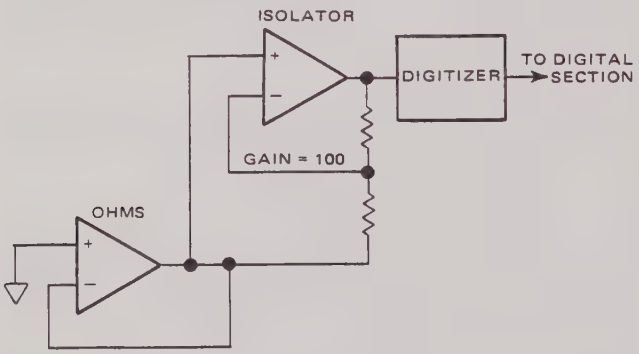
5.3.4.7.8 *DC CAL 7.* The offset of the Isolator/Digitizer configuration is measured in the 100 millivolt range (see block diagram below).



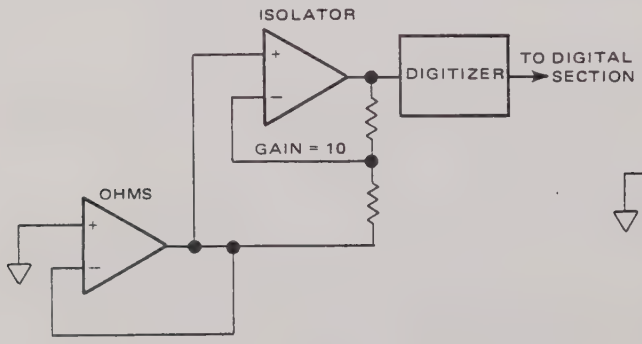
5.3.4.7.9 *DC CAL 8.* The offset of the Preamplifier/Isolator/Digitizer configuration is measured in the 10 millivolt range (see block diagram below).



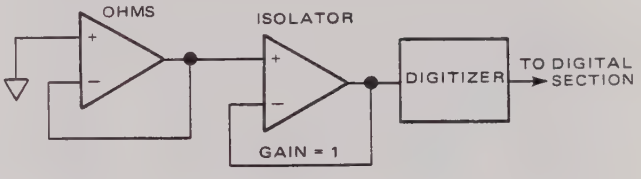
5.3.4.7.10 *Ohms CAL 1.* The offset of the Ohms/Isolator/Digitizer configuration is measured for the 10Ω range (see block diagram below).



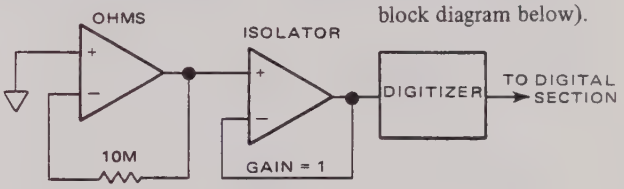
5.3.4.7.11 *Ohms CAL 2.* The offset of the Ohms/Isolator/Digitizer configuration is measured for the 100Ω range (see block diagram below).



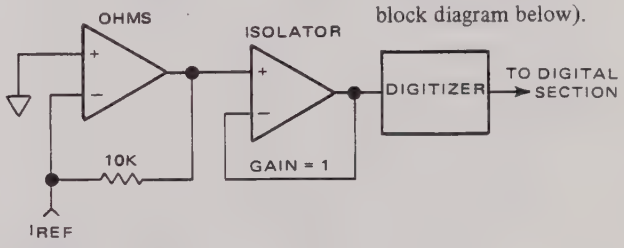
5.3.4.7.12 *Ohms CAL 3.* The offset of the Ohms/Isolator/Digitizer configuration is measured for the 10KΩ and higher ranges (see block diagram below).



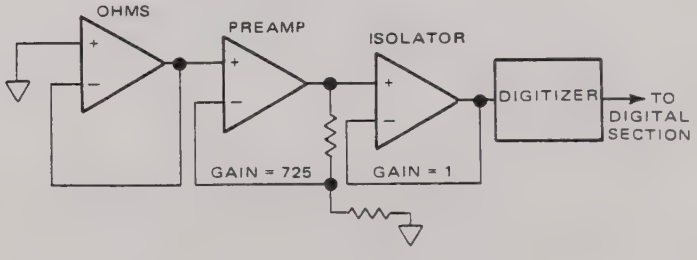
5.3.4.7.13 *Ohms CAL 4.* The offset due to input bias current is measured for the 10KΩ and higher ranges (see block diagram below).



5.3.4.7.14 *Ohms CAL 5.* The accuracy of the internal 10KΩ resistance standard is measured in the 10KΩ range (see block diagram below).



5.3.4.7.15 *Ohms CAL 6.* The offset of the Ohms/Preamplifier/Isolator/Digitizer configuration is measured for the 1Ω range (see block diagram below).



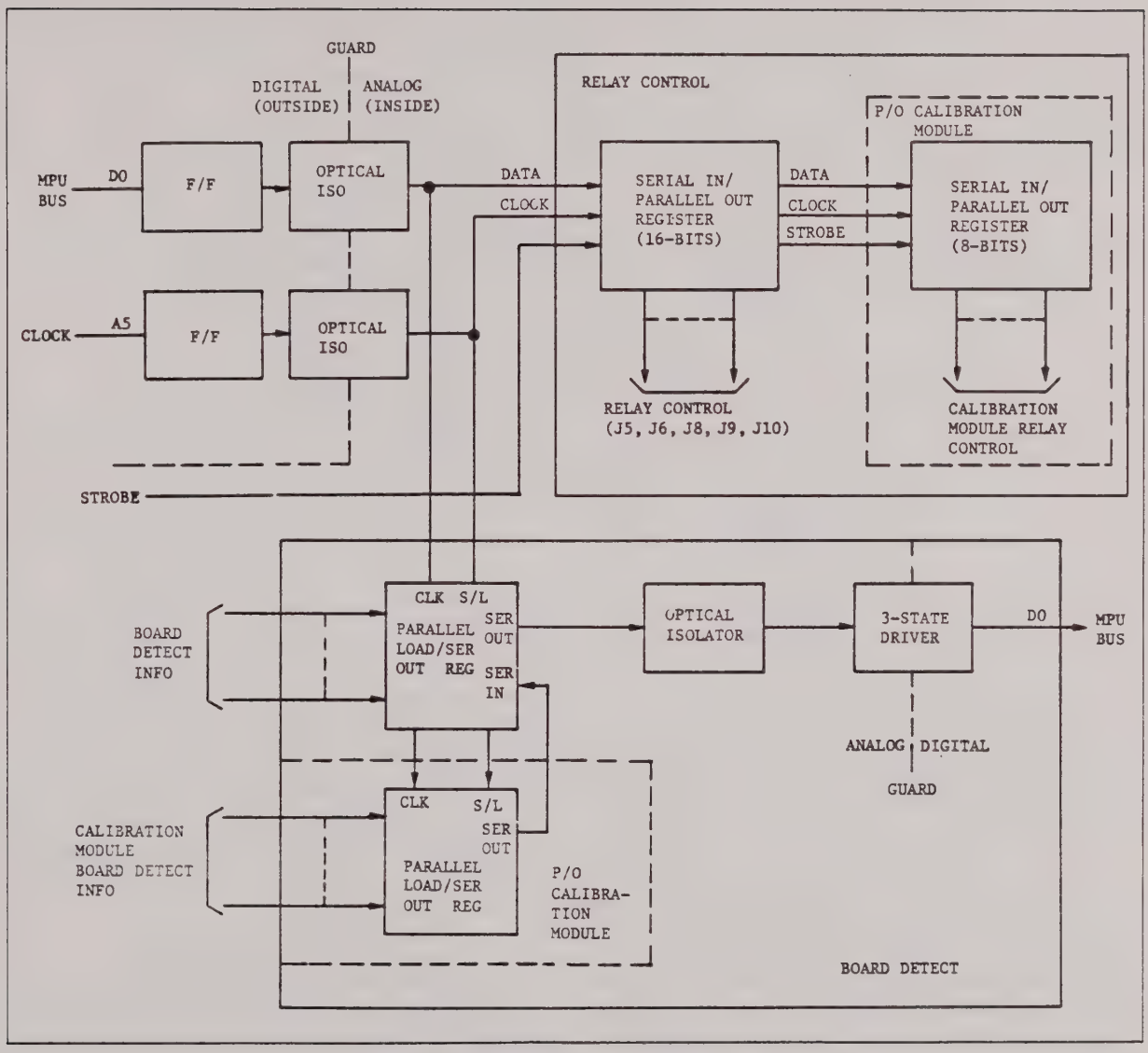


Figure 5.14 - Relay Control and Board Detect

5.3.5 Circuit Descriptions.

5.3.5.1 The following paragraphs contain descriptions of the circuitry and block diagrams of the circuit boards in the analog section. Detailed schematics may be found in Section 7.

5.3.5.2 MOTHERBOARD.

5.3.5.2.1 The Motherboard provides connectors for the insertion of the printed circuit boards (analog and digital), interconnections between the circuit boards, and power supplies. The Motherboard also contains the board detection logic and the control circuitry for the Switching Board relays.

5.3.5.2.2 *Power Supply*. AC line voltage is routed through front panel switch S101 to transformer T201. The secondary voltages are rectified, filtered and regulated to provide the required DC voltages. The digital half of the supply provides three +5 volt supplies and a −30 volt supply. The analog half of the supply is located inside of the guard area and produces regulated voltages of +5 volts, +15 volts, +24 volts, −15 volts and −24 volts. An unregulated voltage of −40 to −85 volts (labeled −40V) is generated for use in the Digitizer. Unregulated ± 30 volts is supplied to the Isolator.

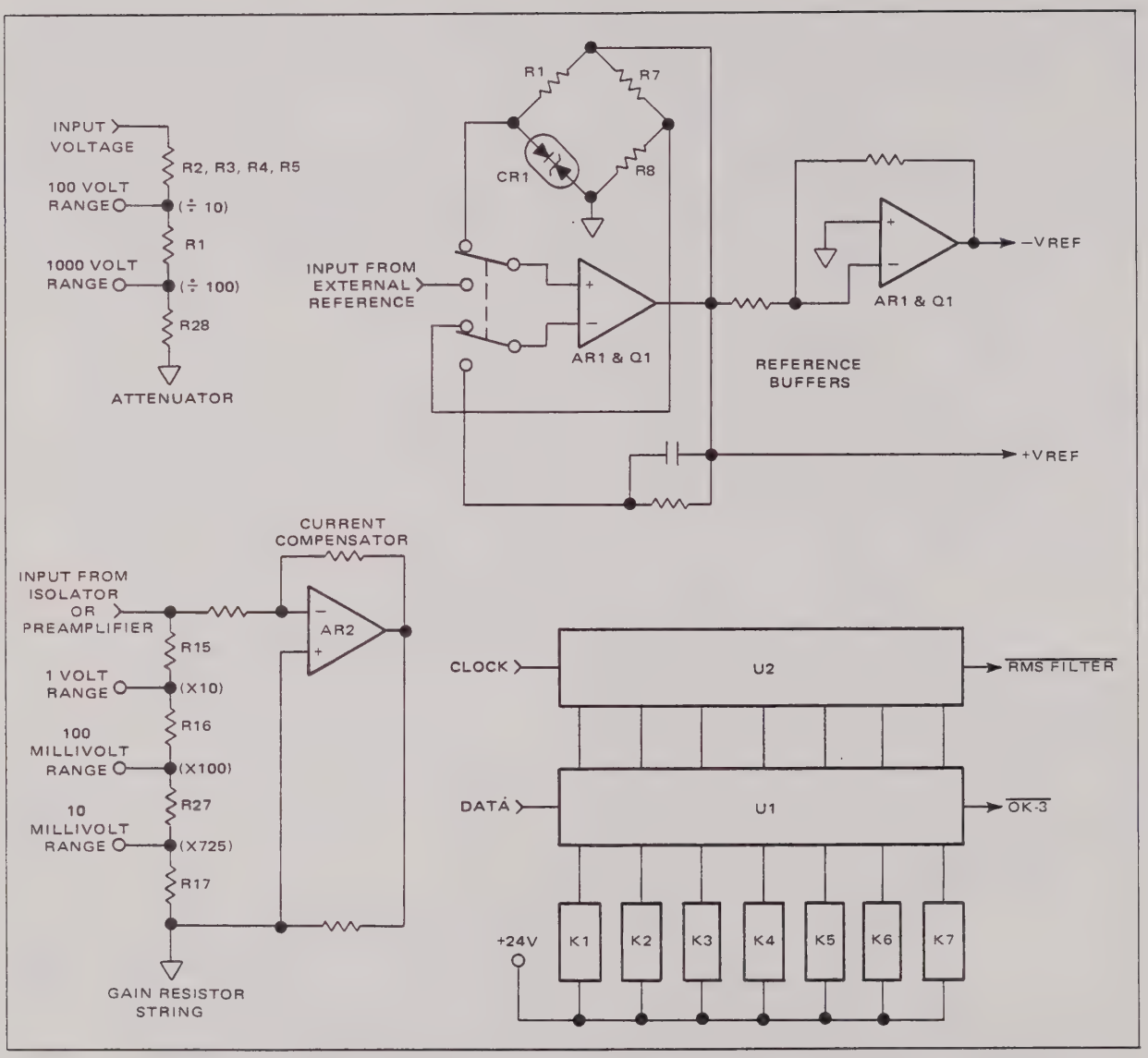


Figure 5.15 - Attenuator/Reference Board Block Diagram

5.3.5.2.3 *Relay Control Circuitry.* The relay control circuitry (Figure 5.14) consists of two flip-flops (U6), two opto-isolators, two serial to parallel shift registers (U4 and U9) and twelve relay drivers (U5 and U6). Control bits from the microprocessor are clocked through U6 and the opto-isolators and into the shift registers. The shift register outputs are buffered by the relay drivers.

5.3.5.2.4 *Board Detection Logic.* The board detection logic (Figure 5.14) consists of two parallel to serial shift registers (U2 on the Motherboard and U1 in the Cal Module) and an opto-isolator. After the relay control bits are loaded into U4 and U9, the clock and data lines from the microprocessor are used to load the board detection shift registers. The bits are then shifted out of the registers and to the microprocessor through the opto-isolator. The microprocessor uses the information to determine which functions, ranges and Auto-Cal procedures may be performed by the instrument.

5.3.5.3 SWITCHING BOARD.

5.3.5.3.1 The Switching Board contains relays, controlled by the microprocessor and the relay control logic on the Motherboard, which provide selection and routing for input signals. The Switching Board also provides one pole of the

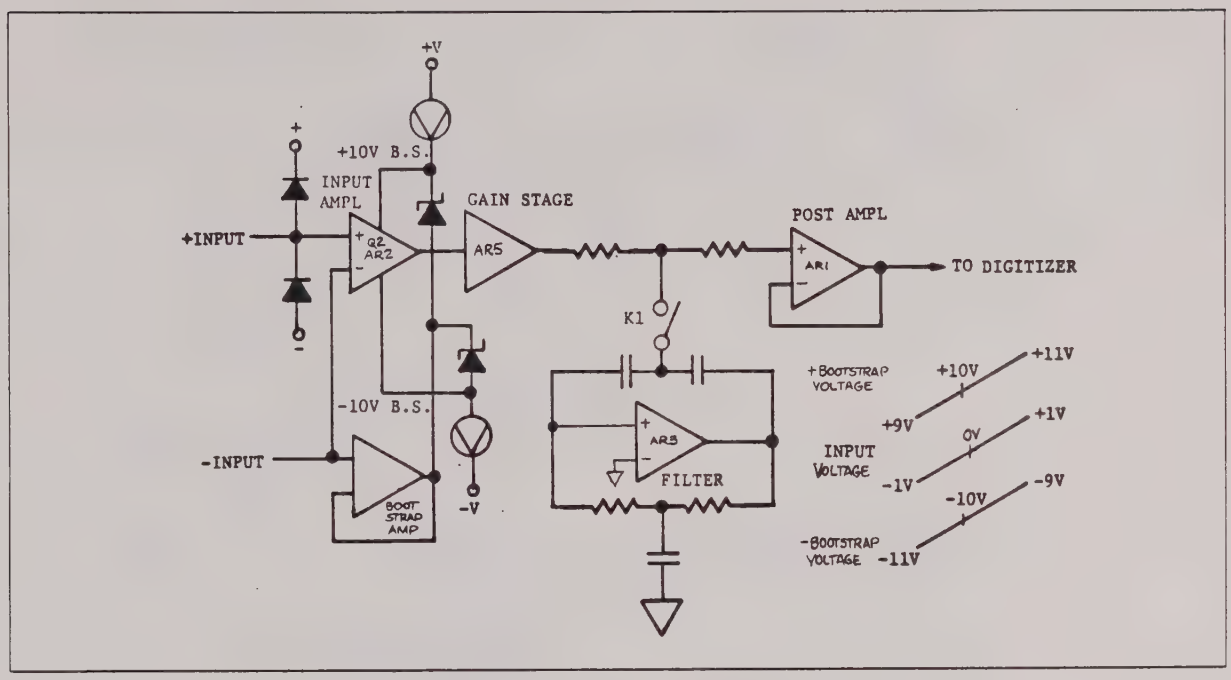


Figure 5.16 - Isolator Block Diagram

switchable 4-pole active filter at the input of the Isolator. The RC network of R1, R2 and C1 provide filtering in all functions and ranges except the 100 and 1000 volt DC ranges. Filtering in the 100 and 1000 volt DC ranges is provided by C2 in conjunction with the attenuator resistors. The other three poles of the active filter are provided in the Isolator.

5.3.5.4 ATTENUATOR/REFERENCE BOARD.

5.3.5.4.1 The Attenuator/Reference Board (Figure 5.15) provides a signal attenuation network, a gain resistor network and reference voltage circuitry. The Attenuator/Reference Board also contains on-board relays and relay control logic.

5.3.5.4.2 *Attenuator.* The signal attenuation network is a resistor voltage divider comprised of R1 through R5 and R28. The input signal is attenuated by a factor of 10 in the 100 volt DC range and by a factor of 100 in the 1000 volt DC range.

5.3.5.4.3 *Gain Resistor Network.* The gain of the Isolator and Preamplifier is set by the feedback resistors in the gain resistor network. The resistor network (R15, R16, R17 and R27) provides Isolator gains of 1, 10 and 100, and a Preamplifier gain of 725. Operational amplifier AR2 provides current compensation for the low ohms ranges.

5.3.5.4.4 *Voltage Reference.* The voltage reference circuitry provides internal references of +10 volts and −10 volts or positive and negative reference voltages proportional to an external reference. The internal reference is developed by a reference bridge comprised of R1, R7, R8 and CR1 on the Reference Assembly.

5.3.5.4.5 The selected reference voltage (internal or external) is routed to the inputs of operational amplifier AR1 on the 10 Volt Reference Board. The positive reference is applied to the DMM through current amplifier Q1. Operational amplifier AR1 and transistor Q1 on the Attenuator Board derive the minus reference voltage from the positive reference.

5.3.5.5 ISOLATOR BOARD.

5.3.5.5.1 The Isolator (Figure 5.16) consists of a high open loop gain amplifier, a bootstrap amplifier and three poles of the switchable 4-pole active filter. The Isolator is connected in a potentiometric gain configuration with feedback resistors located on the Attenuator/Reference Board. Gains of 1, 10 or 100 are provided by the Isolator, depending on the range and function selected.

5.3.5.5.2 *Bootstrap Amplifier.* The bootstrap amplifier (Q5, Q6, Q7 and operational amplifier AR4) generates bootstrap voltages of approximately +10 volts DC and −10 volts

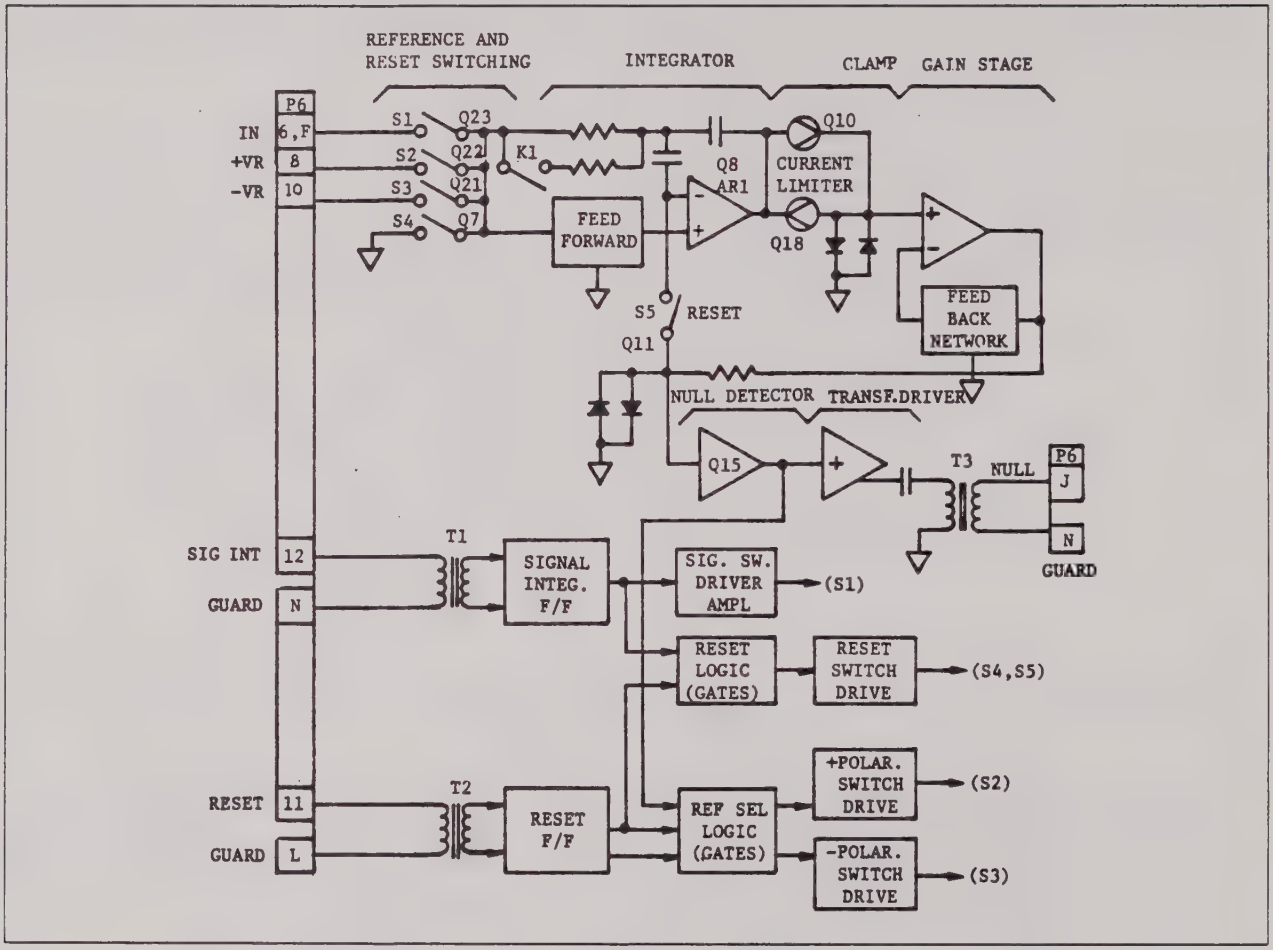


Figure 5.17 - Digitizer Block Diagram

DC when the input to the Isolator is 0 volts DC. As the input voltage increases in the positive direction, both of the bootstrap voltages also increase an equal amount in the positive direction. As the input moves in the negative direction, both of the bootstraps move an equal amount in the negative direction. This bootstrap effect provides an effective input impedance greater than 10,000 megohms. Figure 5.16 illustrates the relationship.

5.3.5.5.3 *Forward Gain Stages.* Isolator gain stages are provided by Q2 and operational amplifiers AR2; AR5 and AR1. Input over-voltage protection is provided by Q1, Q3, Q8, Q9 and CR5 through CR7.

5.3.5.5.4 *Active Filter.* The switchable filter is an active 3-pole Bessel type formed by operational amplifier AR3. The filter is connected by relay K1 ahead of the final section of the gain stage (AR1).

5.3.5.6 DIGITIZER BOARD.

5.3.5.6.1 The Digitizer (Figure 5.17) performs the analog to digital conversion in the DMM. The circuitry includes integration circuitry, a switching network, gain stage, null detection and signal and reset logic.

5.3.5.6.2 *Integrator.* The Integrator consists of an operational amplifier (AR1 and Q8) with a capacitive feedback path to convert the DC levels applied at the input to a corresponding ramp voltage at the Integrator output. The use of a dual FET input stage (Q8) provides for a high input impedance, permits capacitor input coupling during the integration period and allows for auto-zeroing during reset. The feed forward circuitry is a voltage divider network (R15 through R17 and C4) that applies a portion of the reference voltage to the non-inverting input of the Integrator during the reference integration period. This causes an equal amount of voltage to appear at the output.

5.3.5.6.3 *Input Switches.* The input switching is performed by junction FET's (Q21 through Q23, Q7, Q11 and Q16). At the beginning of the signal integration period, a positive pulse is applied to T1, causing Q1 of the input switching flip-flop to conduct. Q1, in turn, causes the signal input switch (Q23) to apply the input signal to the Integrator. Relay K1-A is energized in the 4 1/2 and 5 1/2 digit modes, placing R14 in parallel with R13, thus decreasing the input time constant and the total integration period. The integration periods are: 100 msec to ramp to 10 volts (6 1/2 digit), 16.67 msec to ramp to 10 volts (5 1/2 digit) and 1.67 msec to ramp to 1 volt (4 1/2 digit).

5.3.5.6.4 At the end of the signal integration period, a negative pulse is applied to T1, causing Q1 to turn off and Q2 to turn on. This change of state causes switch Q23 to open and either Q21 or Q22 to close. The selection of the appropriate reference voltage is determined by the output of the polarity switch drive flip-flop (U1 and U2). The flip-flop state is set by a pulse from the null detector circuitry (negative pulse for positive input and positive pulse for negative input). The Integrator will integrate the positive reference when there is a negative input signal and the negative reference when there is a positive input signal.

5.3.5.6.5 The end of the reference integration period occurs when the Null Detector detects an axis crossing and changes state. When a reset pulse is applied to T2, Q4 is turned on and Q3 is turned off. Both of the polarity switch drive flip-flop outputs are set high, which holds both reference switches (Q21 and Q22) open. The reset signal also closes reset switches Q7, Q11 and Q16. Integration timing is shown in Figure 5.18.

5.3.5.6.6 *Gain Stage.* The gain circuitry (Q36, Q30, Q29, Q35, Q17 and Q9) amplifies the output from the Integrator (particularly in the area near zero) to provide a clearly defined axis crossing signal for the null detecting circuitry. The gain stage also exhibits low pass filter characteristics which adds to the total delay of the integration sequence. The added delay reduces the noise response of the system and reduces the wide band response requirements of the Null Detector. The gain circuitry comprises an inverting potentiometric amplifier with programmed gain control. The amplifier provides a gain of 300 for stage inputs up to 13 mV and a gain of 14 for signals above 13 mV.

5.3.5.6.7 *Null Detector.* The Null Detector (Q14 and Q15) is an inverting, closed-loop amplifier with an output swing of five volts. The analog signal from the Integrator is converted to a TTL compatible digital signal, and the logic level of this signal sets the state of the polarity switch drive flip-flop. Output driver Q12 and Q13 and transformer T3 couple the Null Detector output pulse to the Digital Control section of the DMM.

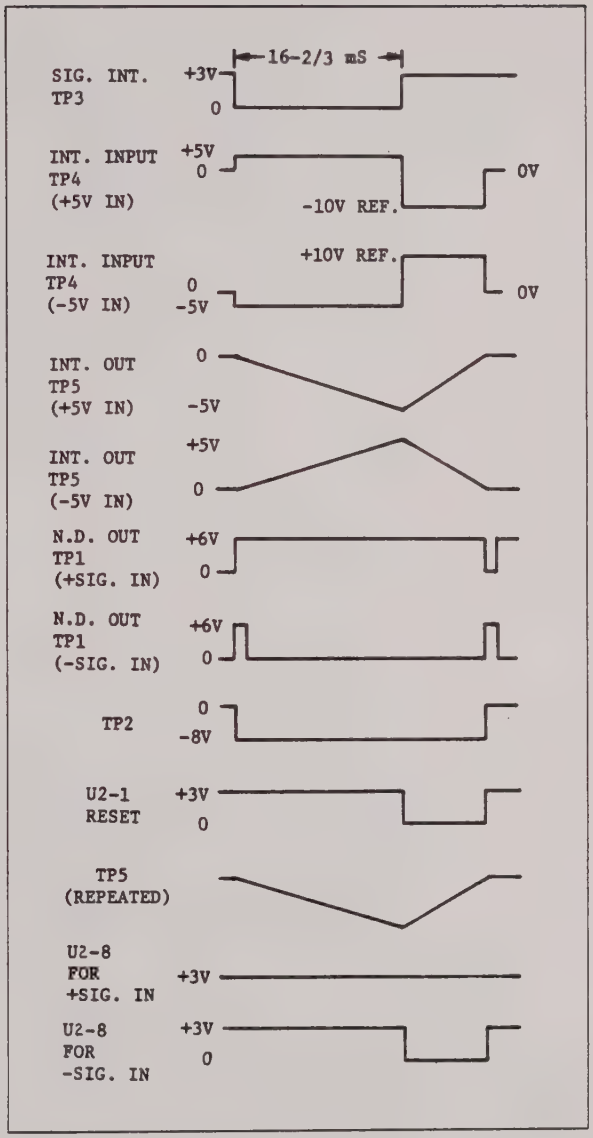


Figure 5.18 - Integration Timing Diagram, 5 1/2 Digit Mode

5.3.5.7 PREAMPLIFIER BOARD (OPTION 41).

5.3.5.7.1 The Preamplifier (Figure 5.19) provides a signal gain of 725 in the 10 mV and 1Ω ranges. The circuitry consists of a modulator, demodulator, oscillator, integrating amplifier and AC amplifier.

5.3.5.7.2 The input signal is routed through the input filter and input clamp to the modulator (Q8 and Q9). The modulator (chopped by the 400 Hz signal from the oscillator of Q8 and Q9) compares the input signal with the Preamplifier feedback signal. The feedback signal is routed from the output of AR1, through K1-A, the gain resistor string (on

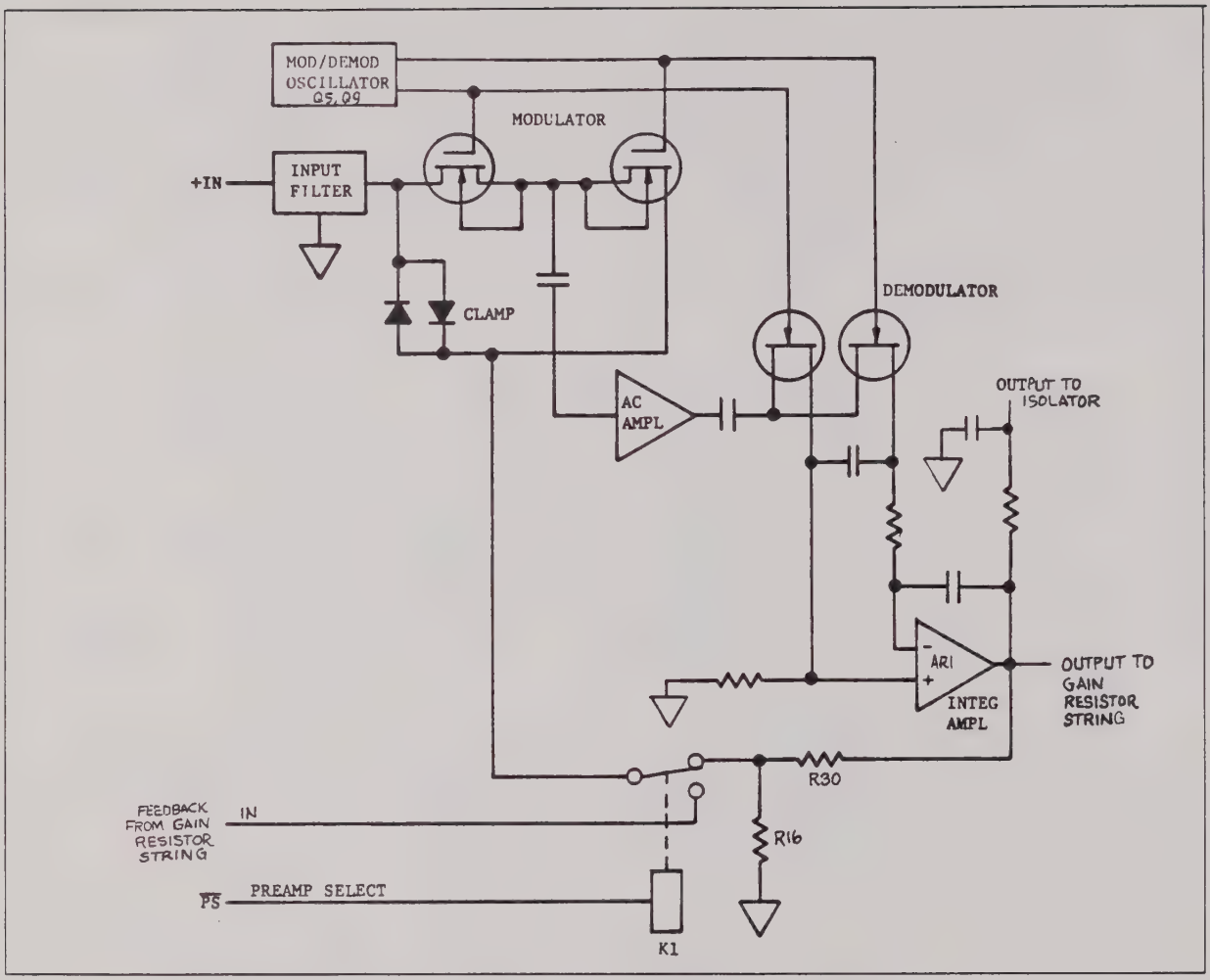


Figure 5.19 - Preamplifier

the Attenuator/Reference Board) and K1-D to the modulator.

5.3.5.7.3 The modulator produces a square wave difference signal which is amplified by the AC amplifier (Q6 and Q7) and rectified by the demodulator (Q1). The DC output level of the demodulator is amplified by the integrating amplifier (AR1) and routed to the output. R16 and R30 close the feedback loop when K1-A and K1-D are de-energized (Preamplifier not selected).

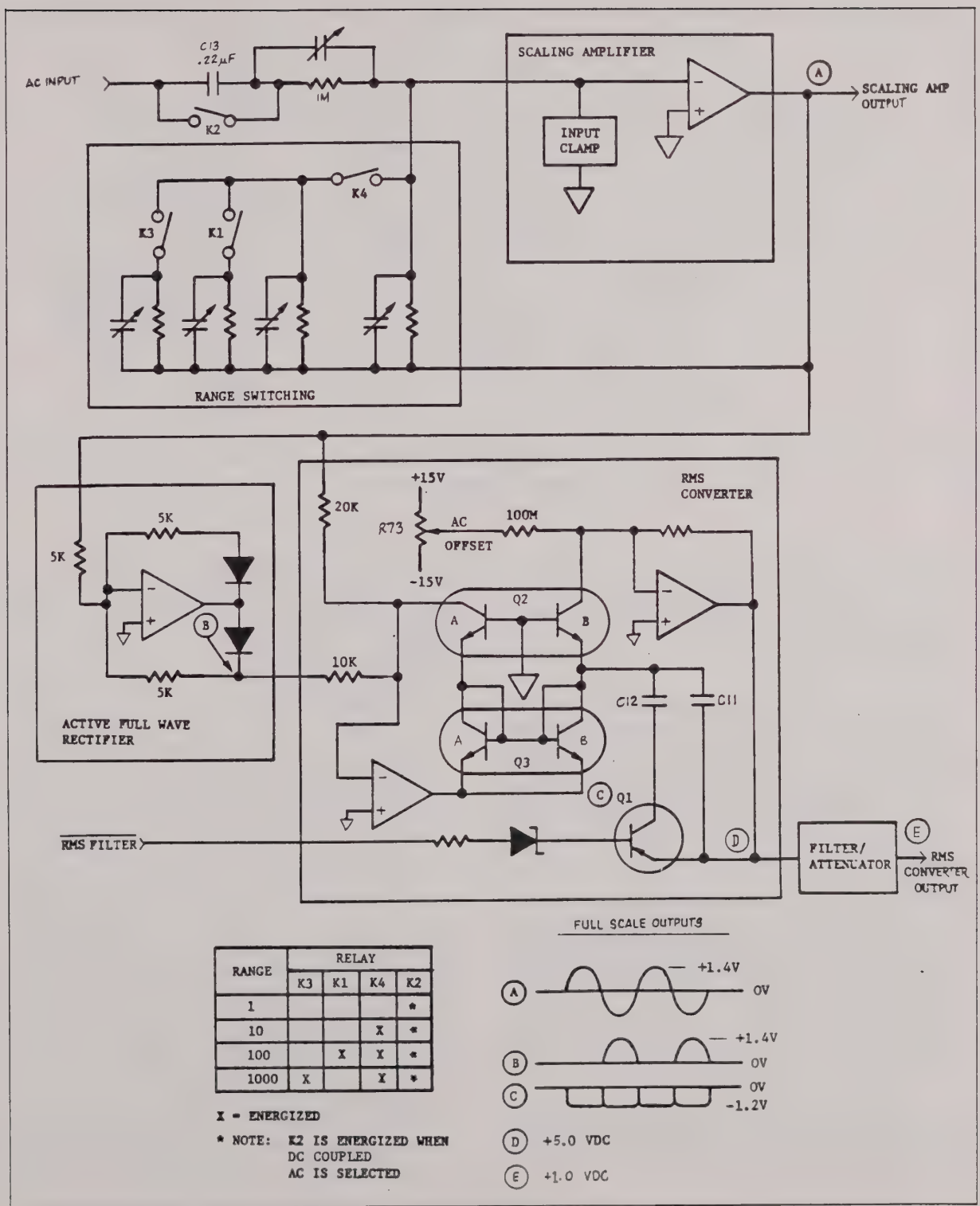
5.3.5.8 TRUE RMS CONVERTER BOARD (OPTION 10).

5.3.5.8.1 The True RMS Converter (Figure 5.20) is comprised of a range switching network, scaling amplifier, active rectifier, RMS converter and attenuator/filter network.

5.3.5.8.2 *Range Switching.* The input signal is routed through C13 (AC coupled AC) or through K2 (DC coupled AC) to the range switching circuitry provides signal attenuation in the 10 volt, 100 volt and 1000 volt ranges. The table in Figure 5.20 details the relay closures for each range.

5.3.5.8.3 *Scaling Amplifier.* The scaling amplifier (Q5 and AR2) is an inverting operational amplifier which takes the input signal and provides a full scale output of 1.4 volts AC peak in all ranges. The feedback path for the amplifier is through the frequency compensated range switching circuitry. Q11-Q14 are clamps to protect Q5 from input overload voltages.

5.3.5.8.4 *Active Rectifier.* The active rectifier circuitry (Q4, Q6 through Q10, CR2 and CR3) is configured as an



RANGE	RELAY			
	K3	K1	K4	K2
1				*
10			X	*
100		X	X	*
1000	X		X	*

X = ENERGIZED

* NOTE: K2 IS ENERGIZED WHEN DC COUPLED
AC IS SELECTED

Figure 5.20 - True RMS Converter

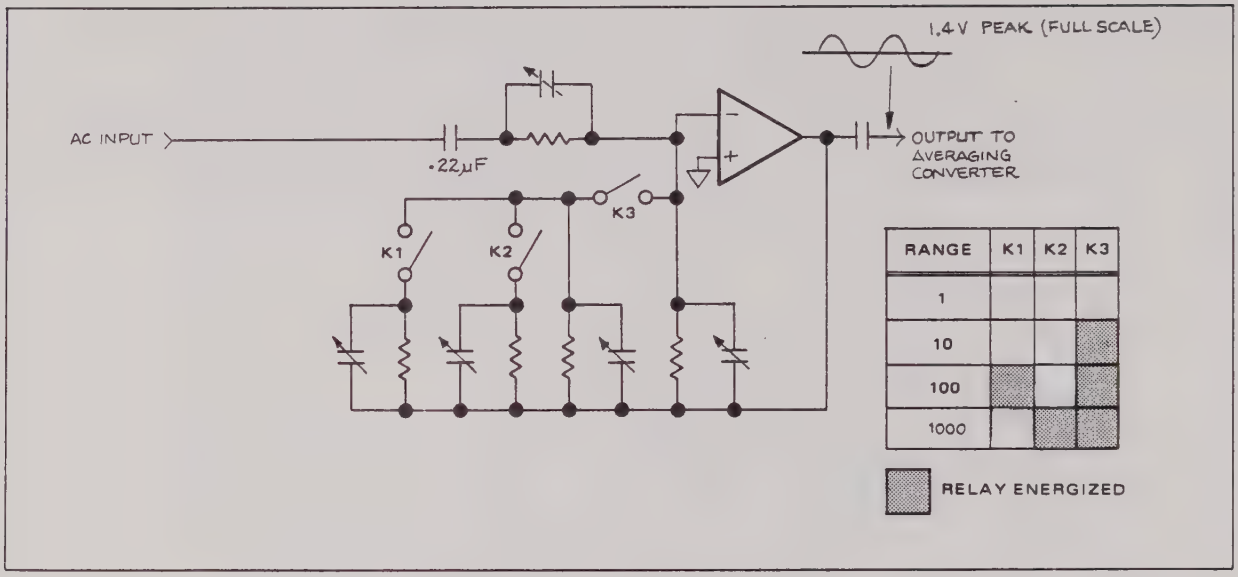


Figure 5.21 - Scaling Amplifier

operational amplifier with two polarity selective feedback paths. One feedback path (through CR3) conducts only with a negative amplifier output. The voltage developed across the positive conducting leg is applied to the input of the RMS converter circuitry.

5.3.5.8.5 *RMS Converter.* The input stage of the RMS converter circuitry (Q2, Q3 and Q15 through Q17) is configured as an operational amplifier with a logarithmic feedback loop. The output of the active rectifier and the output of the scaling amplifier are summed at the input of the log amplifier. The output of the log amplifier is the log of the total input and is routed through Q3B and Q2B to the input of AR1.

5.3.5.8.6 AR1 acts as a summing amplifier and converts the signal to a DC level. The ripple content of the output is filtered and attenuated to provide a scaled DC equivalent of the true RMS value of the original input signal. Q1 connects C12 in parallel with C11 to provide additional filtering when the FILTER key is toggled on.

5.3.5.9 AVERAGING AC CONVERTER BOARDS (OPTION 14).

5.3.5.9.1 The Averaging AC Converter is comprised of two circuit boards: a Scaling Amplifier Board and an Averaging Converter Board.

5.3.5.9.2 *Scaling Amplifier.* The Scaling Amplifier (Figure 5.21) is configured as an AC coupled inverting operational amplifier. The input signal is routed through C17 to the range switching network. The range switching circuitry provides signal attenuation in the 10 volt, 100 volt and 1000 volt ranges. The table in Figure 5.21 details the relay closures for each range.

5.3.5.9.3 The scaling circuitry (Q1 through Q10) takes the input signal and provides a full scale output of 1.4 volts AC peak in all ranges. The feedback path for the amplifier is through the frequency compensated range switching circuitry.

5.3.5.9.4 *Averaging Converter.* The Averaging Converter (Figure 5.22) receives the scaled AC signal from the Scaling Amplifier and applies it to the active rectifier stage. The active rectifier circuitry (Q1 through Q6, Q9 through Q11, AR3, CR2 and CR3) is configured as an operational amplifier with two polarity selective feedback paths. One feedback path (through CR3) conducts only with a negative amplifier output and the other path (through CR2) conducts only with a positive amplifier output. The voltage developed across the negative conducting leg is applied to the input of the summing amplifier circuitry.

5.3.5.9.5 The output of the active rectifier is summed with the output of the Scaling Amplifier at the inverting

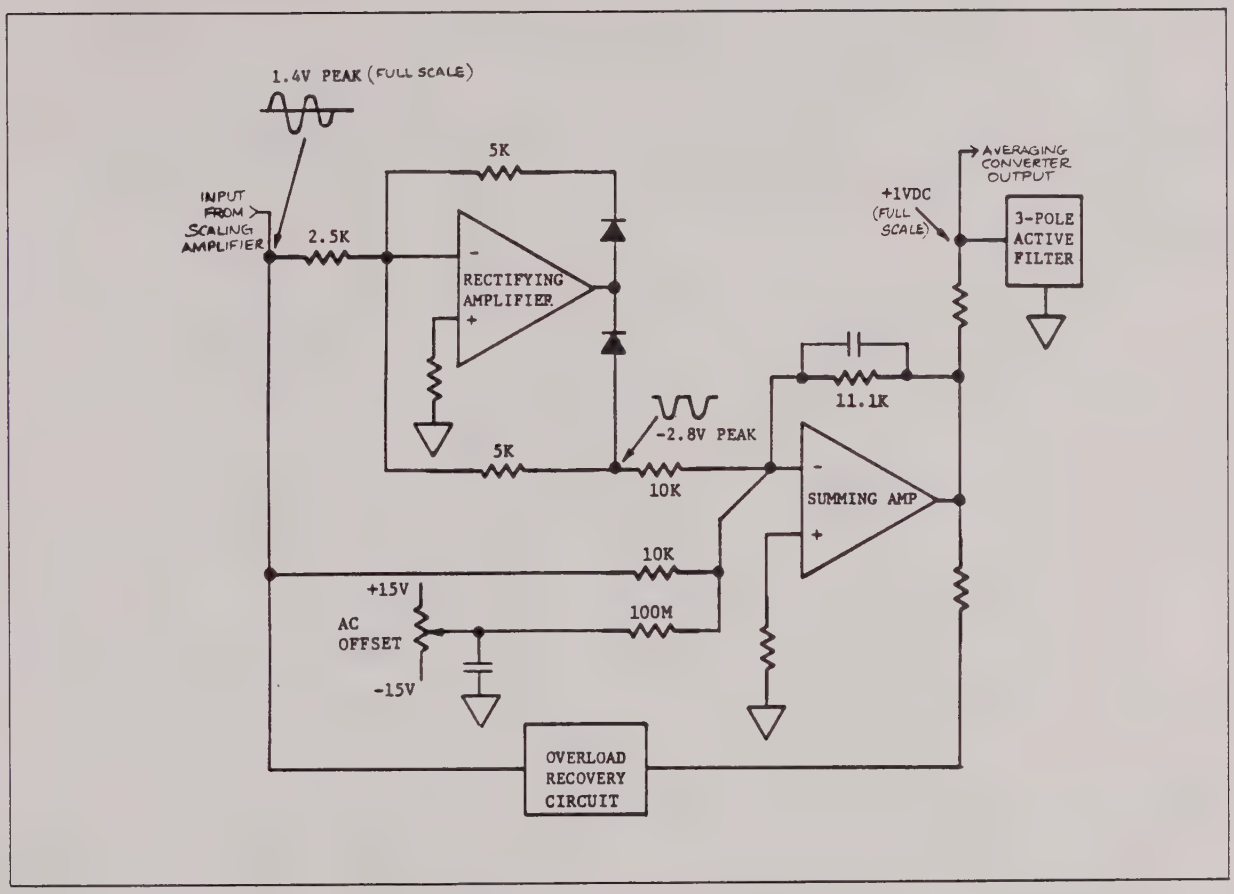


Figure 5.22 - Averaging Converter

input of the summing amplifier (Q8 and AR2). The output of the summing amplifier is 1.11 times the average of the summed inputs. Ripple attenuation is provided by the summing amplifier and the 3-pole active filter (AR1). The AC Averaging Converter output is a scaled DC equivalent of the average value of the original input signal. Fast recovery from overload conditions is provided by Q13 and Q14.

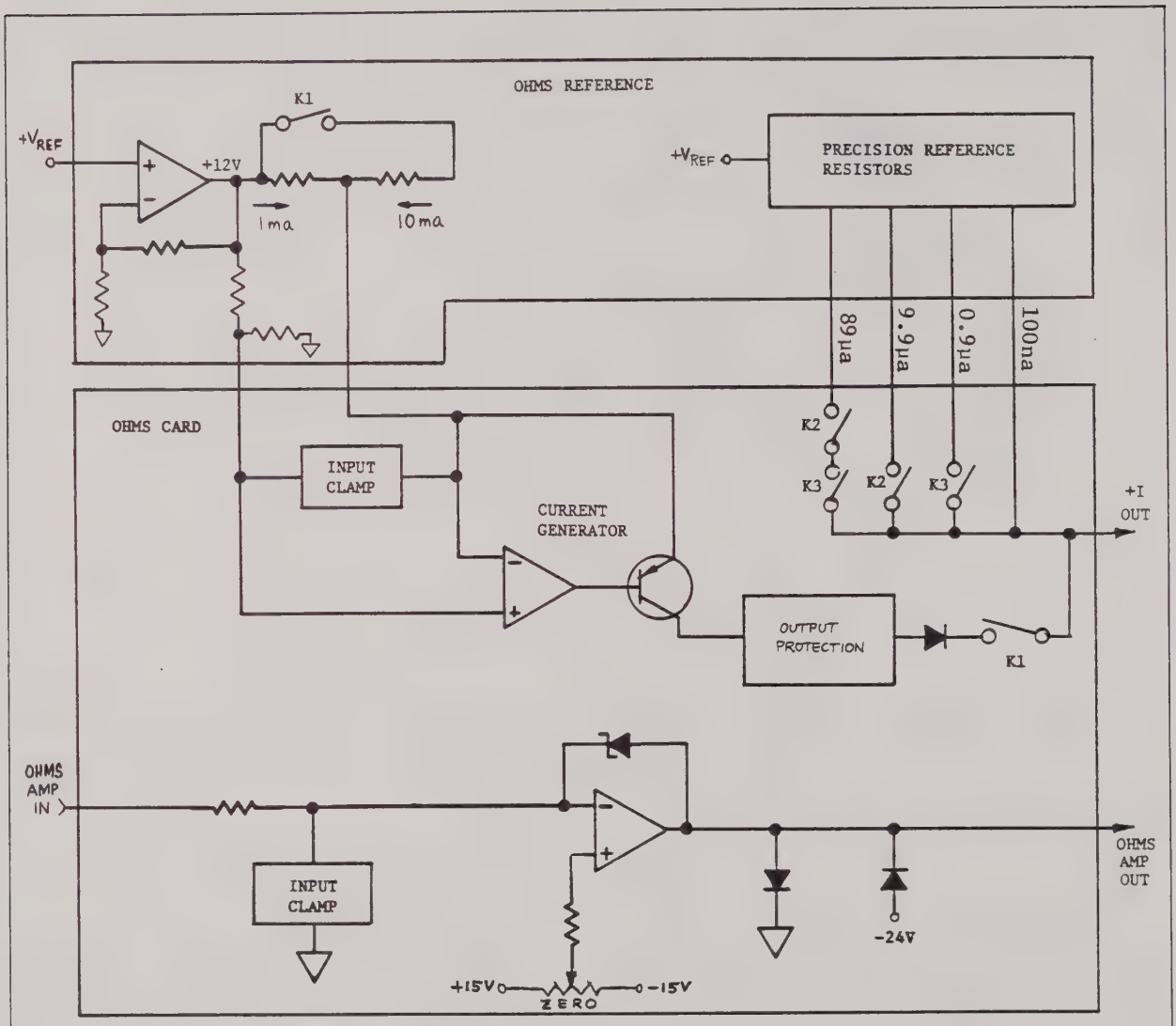
5.3.5.10 OHMS CONVERTER BOARDS (OPTION 24).

5.3.5.10.1 The Ohms Converter (Figure 5.23) is comprised of two circuit boards: Ohms Reference and Ohms Card.

5.3.5.10.2 *Ohms Reference.* The Ohms Reference is comprised of operational amplifier AR1 and a set of precision resistors. The Ohms Reference supplies precision current outputs to the Ohms Card. When K1 is energized, the 1 ma current source becomes a 10 ma current source. The table in Figure 5.23 details the relay closures for each range.

5.3.5.10.3 *Ohms Card.* The Ohms Card routes the appropriate current to the resistance under test and amplifies the returned signal. The current generator (Q1 through Q7 and AR1) supplies the 1 ma or 10 ma output current through K1 on the Ohms Card. The 89.1 μa, 9.9 μa, 900 na and 100 na currents from the Ohms Reference are routed through K2 and K3 and added together to produce 100 na, 1 μa, 10 μa and 100 μa currents. The table in Figure 5.23 details the relay closures for each range. The circuitry formed by Q8 through Q11 and Q15 through Q17 provides overvoltage protection for the current generator.

5.3.5.10.4 The signal returned by the resistance under test is routed to an amplifier circuit consisting of input buffer Q14, gain amplifier AR2 and power amplifier Q20.



RANGE	OHMS CONVERTER			OHMS REFERENCE
	K1	K2	K3	K1
1Ω	■			■
10Ω	■			■
100Ω	■			■
1KΩ	■			
10KΩ	■			
100KΩ		■	■	
1MΩ		■		
10MΩ			■	
100MΩ				

■ ENERGIZED

Figure 5.23 - Ohms Converter

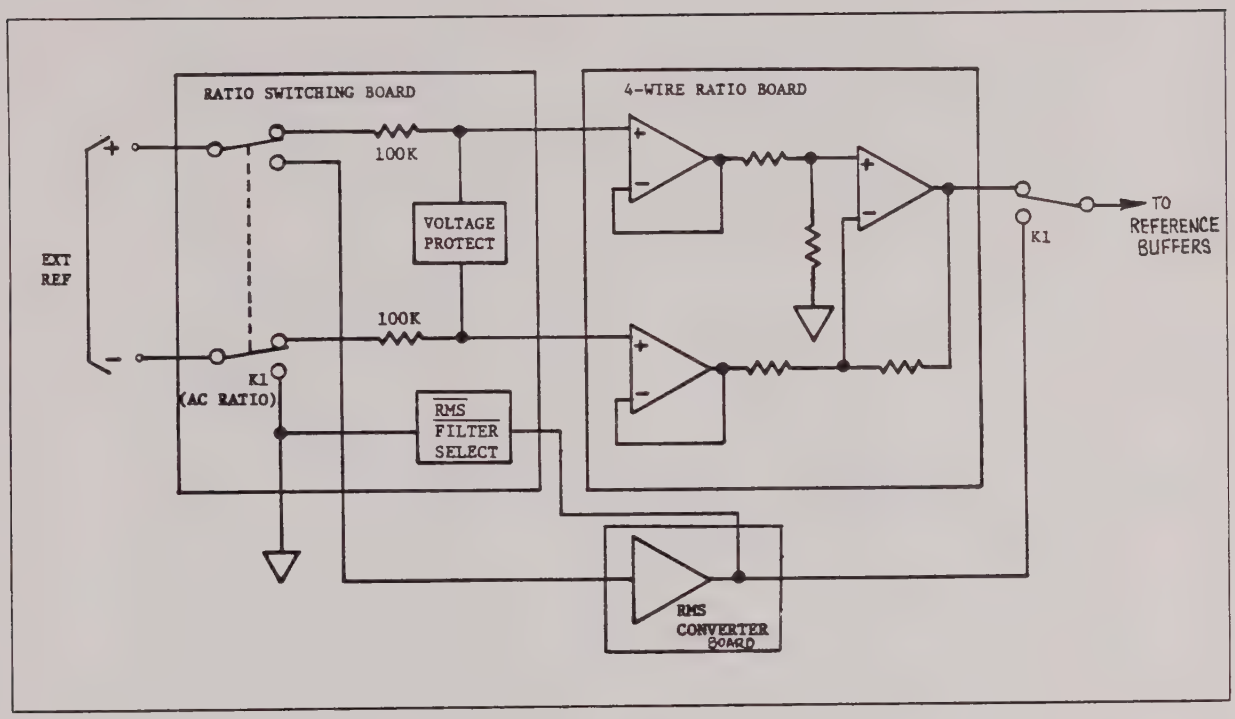


Figure 5.24 - AC/DC Hardware Ratio

5.3.5.11 HARDWARE RATIO BOARDS.

5.3.5.11.1 The Hardware Ratio circuitry (Figure 5.24) consists of the Ratio Switching Board, 4-Wire Ratio Board (Option 34) and RMS Converter Board (Option 11).

5.3.5.11.2 *4-Wire Ratio.* DC external voltages between +1.0 volt and +10.5 volts may be used as the reference for 4-Wire Ratio measurements when DC EXT REF is selected. The differential inputs of the reference are applied to the non-inverting inputs of separate operational amplifiers (AR1 and AR2). The outputs of AR1 and AR2 are applied to the differential inputs of operational amplifier AR3. The 4-Wire Ratio circuitry produces a single-ended output from differential inputs, thus allowing the input reference voltage to float with respect to input signal common.

5.3.5.11.3 *RMS Converter.* External reference voltages from 0.1 to 1000 volts AC or DC can be used when AC EXT REF is selected. In this mode the reference voltage is routed to the RMS Converter. The RMS Converter is identical to the True RMS Converter Board described in paragraph 5.3.5.8.

5.4 DIGITAL CONTROL.

5.4.1 The following paragraphs present a detailed analysis of the Digital Control section. A block diagram may be found in Figure 5.25.

5.4.2 The Digital Control section of the Model 6000 contains the following boards:

- Computer (J3)
- Display/Keyboard
- Control Logic (J4)
- Calibration Memory
- Fast Waveform Digitizer (J5)

5.4.3 Circuit Descriptions.

5.4.3.1 The following paragraphs contain descriptions of the circuitry and block diagrams of the circuit boards in the Digital Control section. Detailed schematics may be found in Section 7.

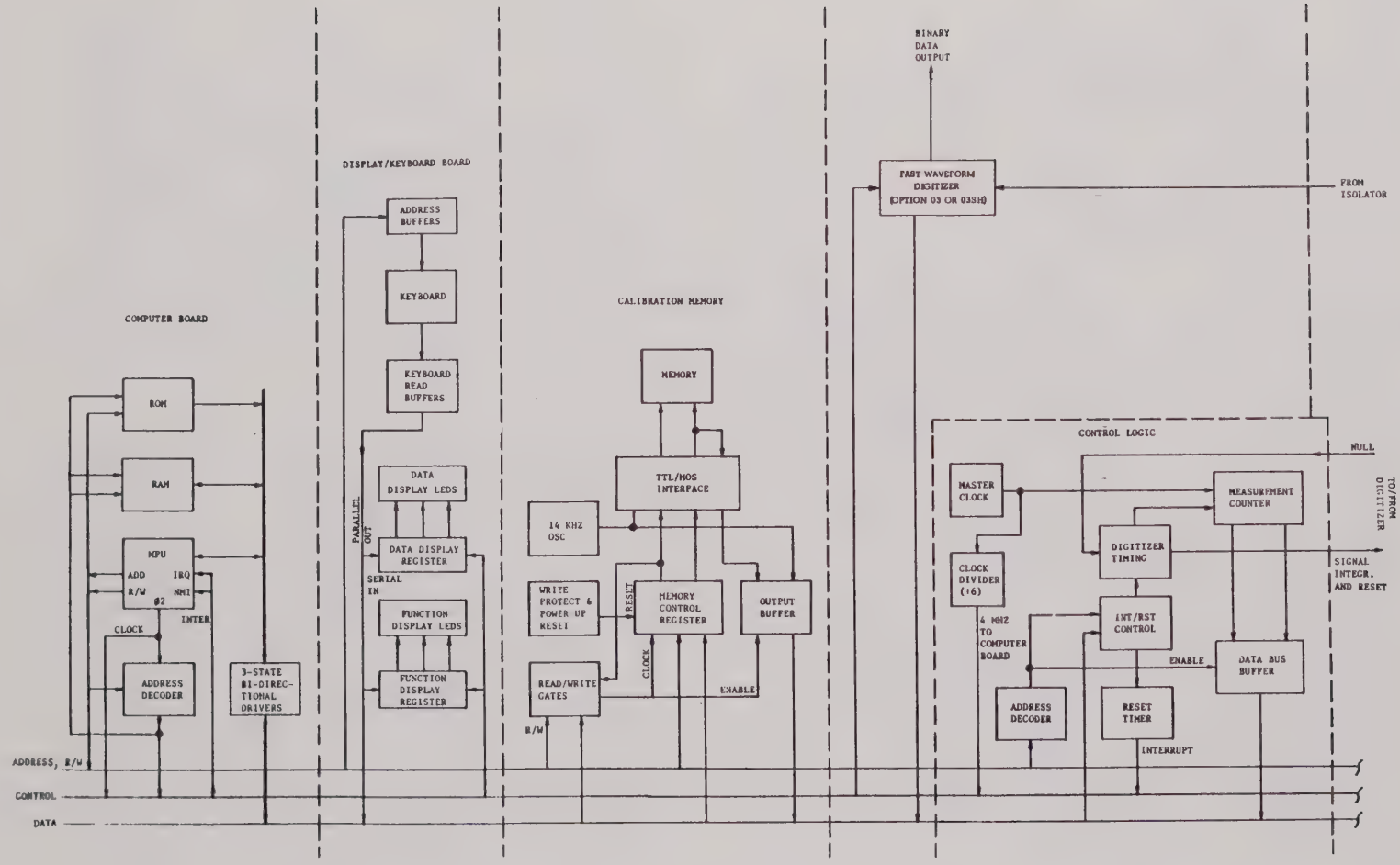


Figure 5.25 - Digital Section Block Diagram

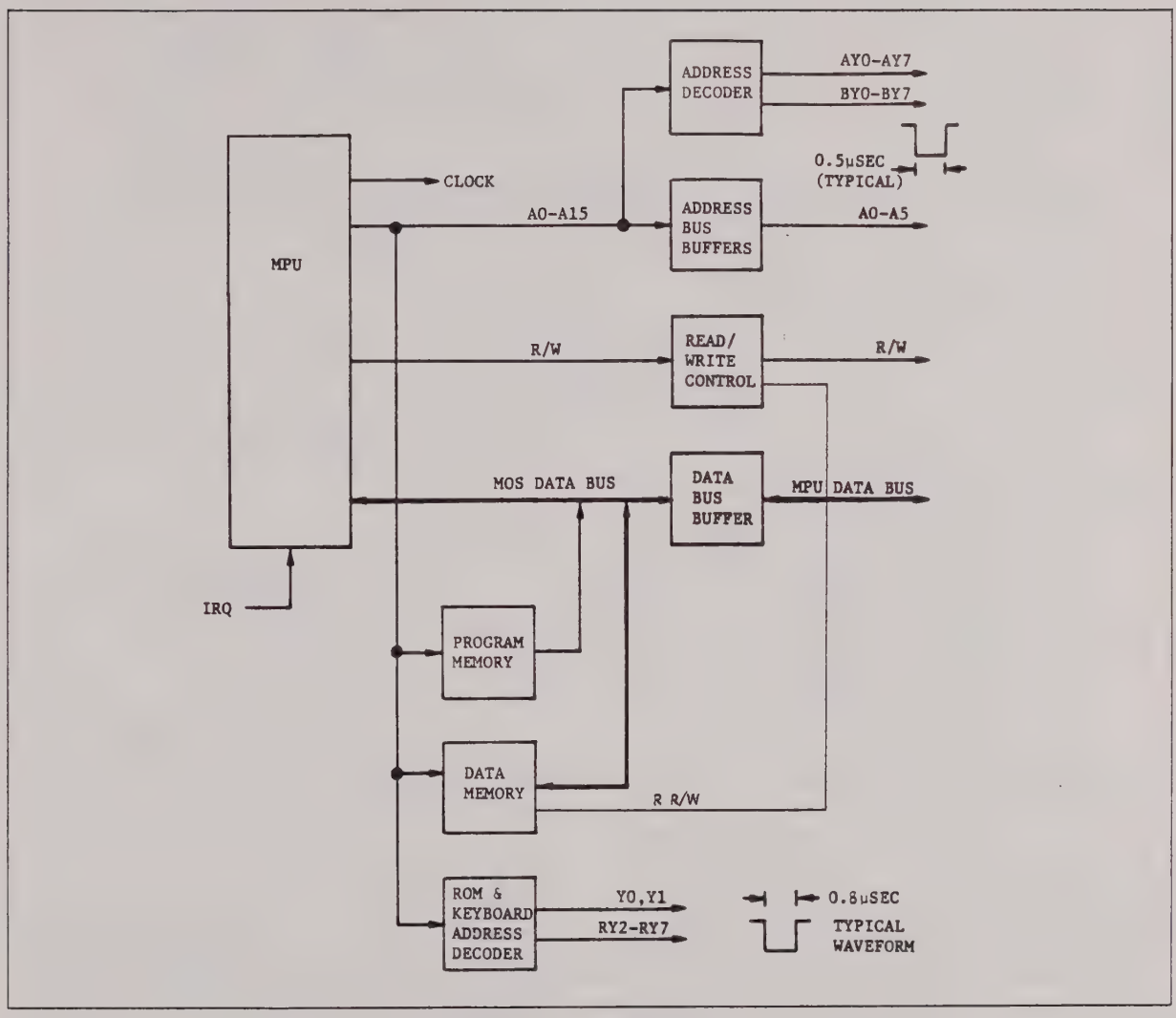


Figure 5.26 - Computer Board

5.4.3.2 COMPUTER BOARD.

5.4.3.2.1 The Computer Board (Figure 5.26) contains program storage and processing circuitry. The circuitry consists of a microprocessor, random access memory (RAM), read only memory (ROM), address decoders and read/write control logic.

5.4.3.2.2 *Microprocessor.* The microprocessor (U12) is an 8-bit unit with built in clock generator and 128x8 RAM. The microprocessor provides for processing of the digital data within the DMM. The data bus lines are routed through three-state buffers U5, U6 and U7. Address lines A0 thru A5 are routed through three-state buffer U8.

5.4.3.2.3 *Memory.* The memory circuitry consists of RAM and ROM. The RAM (U13 thru U16 and part of the microprocessor) provides a total of 640 bytes of temporary data storage area. The ROM (U17 thru U21 and U11) provides 10k bytes of primary program storage and 2k bytes of storage for the interface program.

5.4.3.2.4 *Address and Read/Write Logic.* The address decoding circuitry (U3, U9 and U10) decodes the address lines into separate enable lines for the circuits which are connected in common to the data bus. The read/write control logic (U1, U2, U4 and U6) provides the proper read and write timing during data processing.

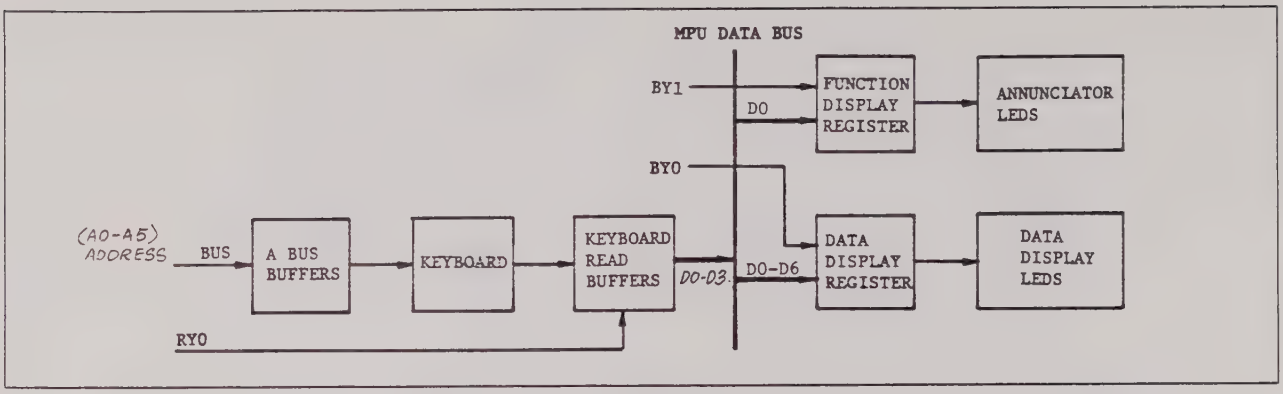


Figure 5.27 - Display/Keyboard

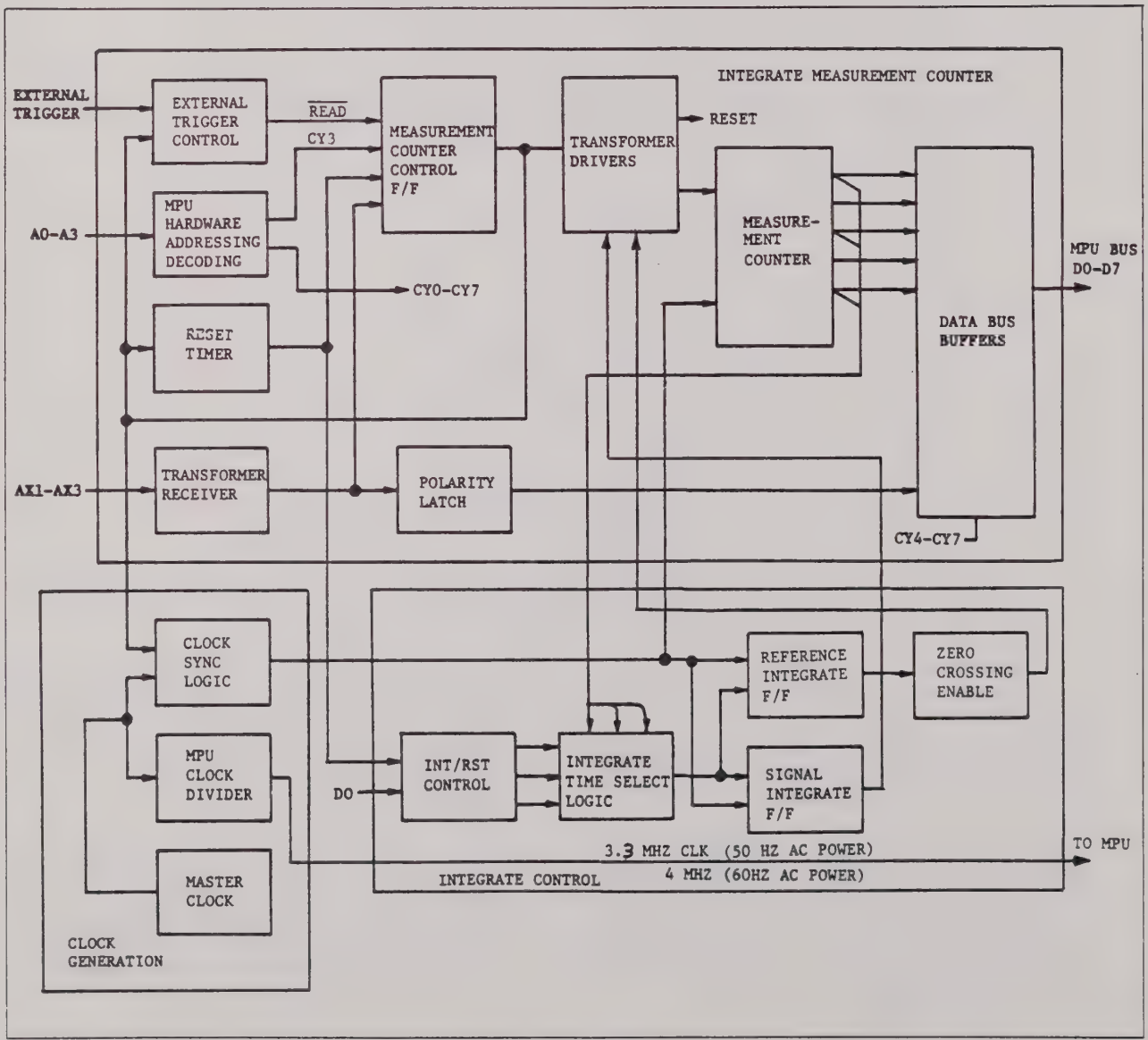


Figure 5.28 - Control Logic

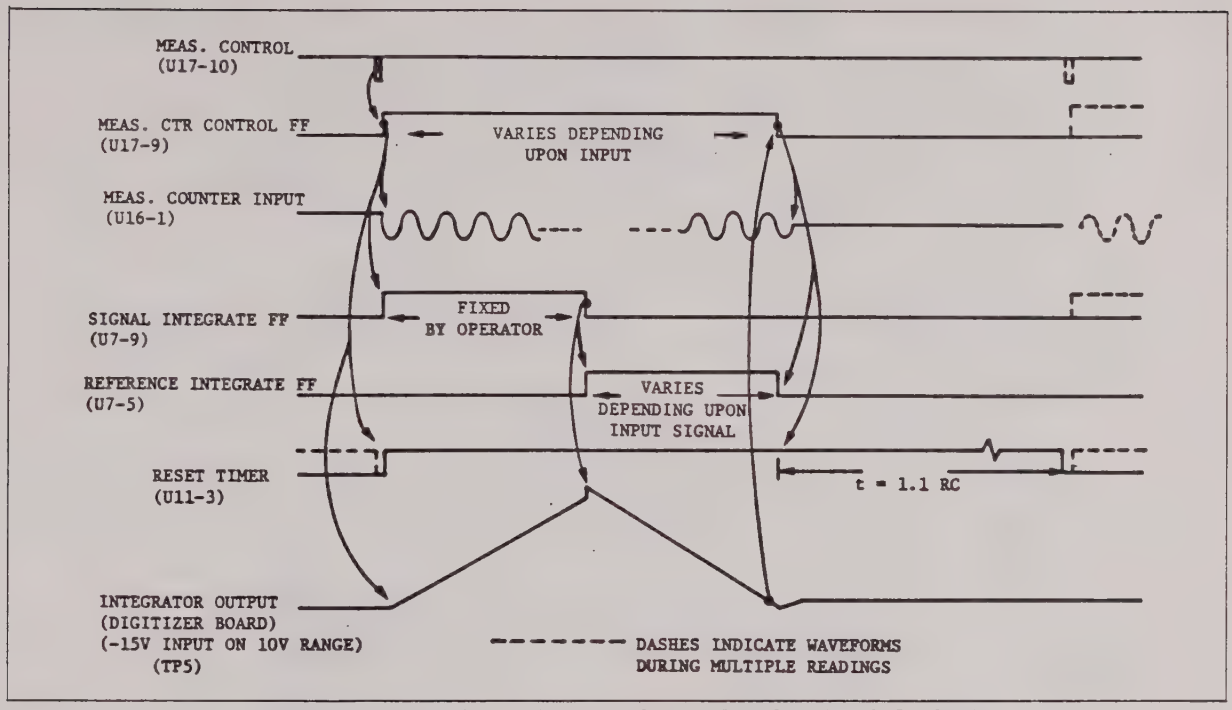


Figure 5.29 - Control Logic Digitizer Schematic Waveform (Single Reading)

5.4.3.3.1 DISPLAY/KEYBOARD.

5.4.3.3.1 The Display/Keyboard (Figure 5.27) provides for input of function and range information and for the display of data and operational statuses.

5.4.3.3.2 *Keyboard.* The Keyboard circuitry (U11 and U12) provides for the input of addresses from the Computer Board and the output of data from the Keyboard matrix. When the microprocessor addresses the Keyboard (RYO low), it also places ones on address lines A0 thru A5. If a key is pressed, the microprocessor will manipulate the pattern on address lines A0 thru A5 until the position of the pressed key is determined.

5.4.3.3.3 *Display.* The Display circuitry (U1 thru U10, LED 1 thru LED 9 and CR1 thru CR27) provides a display for data readout and annunciators for status indication. The function display registers (U8, U9 and U10) receive a 24-bit serial input which determines the status of the annunciators. The function data are received on data line D0 and are clocked into the registers by BY1 from the microprocessor address decoders.

5.4.3.3.4 The data display registers (U1 thru U7) receive a similar string of data from the microprocessor. The display data are received on data lines D0 thru D6 and are clocked into the registers by BY0 from the microprocessor address decoders. The outputs from the data display registers enable the segments of the display LEDs.

5.4.3.4 CONTROL LOGIC BOARD.

5.4.3.4.1 The Control Logic Board (Figure 5.28) provides the timing circuitry, integration control logic and measurement counters for the DMM.

5.4.3.4.2 *Timing Circuitry.* The timing circuitry contains a master clock (Q6, Q9 and Y1) that operates at 24 MHz in 60 Hz AC machines and at 20 MHz in 50 Hz AC machines. The output of the master clock circuit is routed to the clock sync flip-flop (U17) and to the clock divider circuit (U20 and U21). The clock divider circuit outputs a 4 MHz clock (60 Hz machines) or a 3.3 MHz clock (50 Hz machines for use by the microprocessor.

5.4.3.4.3 *Integration Control Logic.* The integration measurement counters (U12 thru U16) are enabled when a microprocessor trigger (CY3 output of the address decoder) or an external trigger initiates a measurement cycle. The trigger causes the measurement counter control flip-flop (U17) to set. This, in turn, causes the clock sync logic flip-flop (U17) to set, thus allowing a synchronized clock signal to clock the measurement counter. The signal integrate flip-flop (U7) is also set, and the output is applied to the signal integrate transformer driver (Q1, Q2). Figure 5.29 shows the Control Logic and Digitizer waveform relationships.

5.4.3.4.4 The signal integrate flip-flop (U7) is reset when the measurement count reaches a level that corresponds to

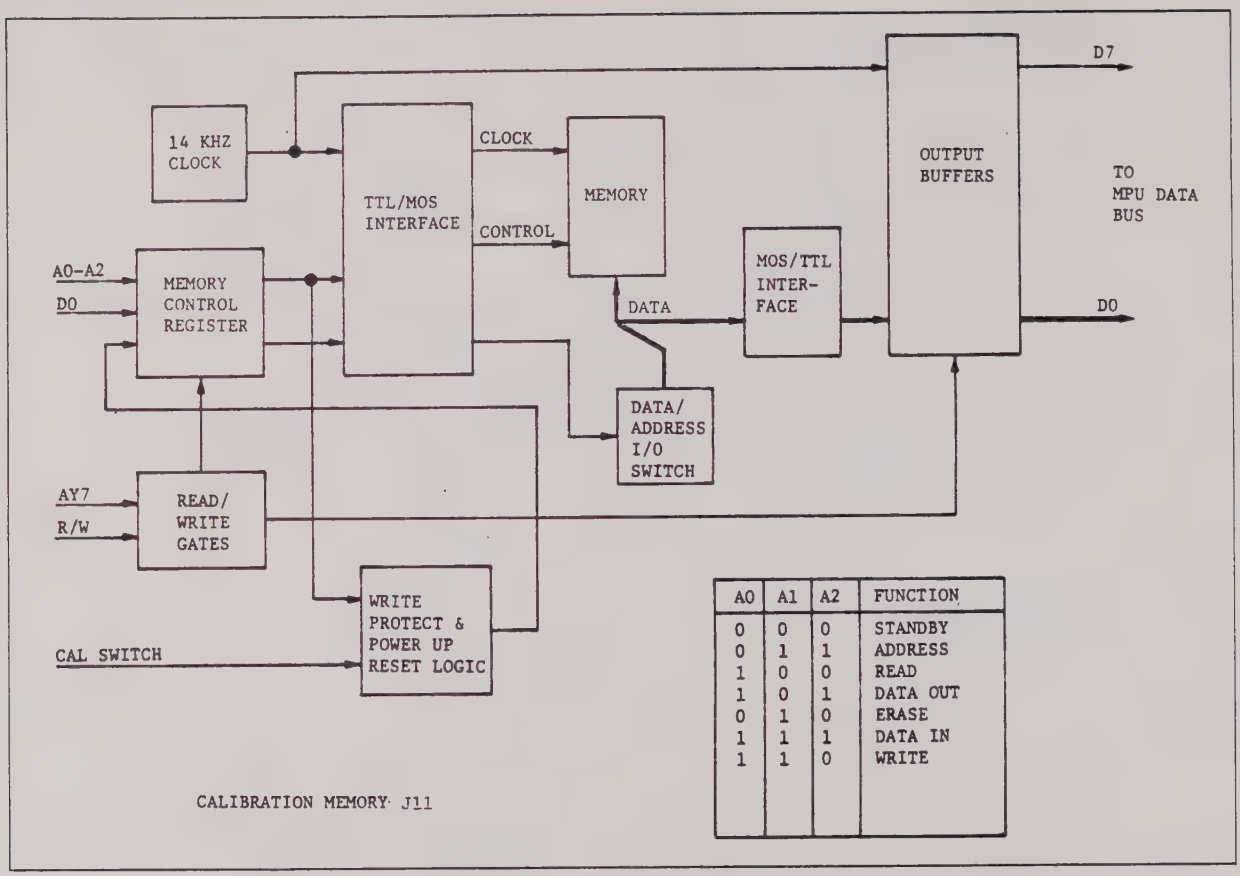


Figure 5.30 - Calibration Memory

the selected integration period. The three upper decades of the counter (U12 thru U14) are also reset, and the reference integrate flip-flop (U7) is set. The Q output of the reference integrate flip-flop enables one input of the NAND gate (U6) in the zero-crossing enable circuit (U6 and U19). When a zero-crossing signal is received on transformer lines AX1 and AX3, the measurement counter control flip-flop (U17) is reset, the clock sync logic flip-flop is disabled and the input to the measurement counter is stopped.

5.4.3.4.5 At the end of the measurement sequence, the information stored in the measurement counter and the polarity latch (U19) is requested by the microprocessor. The three-state data bus buffers (U1 thru U5) are sequentially enabled to place the data on the data bus.

5.4.3.5 CALIBRATION MEMORY BOARD.

5.4.3.5.1 The Calibration Memory (Figure 5.30) provides storage for the calibration offset factors. The circuitry consists of an electrically alterable read only memory, a clock generator and associated logic.

5.4.3.5.2 *Memory*. The memory (U4) transmits and receives data and address information on a single data line. Information on the data line is in serial form and is clocked in or out of the memory by the 14 KHz clock signal provided by U6. The three control lines for the memory are latched into U1. The table in Figure 5.30 lists the various combinations of control line addresses and the resultant functions.

5.4.3.5.3 The logic formed by U2 and U3 resets the memory control register to the "standby" address during power up. The "standby" address is also entered if the microprocessor sends a "write" address when the LAB CAL switch is off. Data/address switch Q6 is enabled whenever the microprocessor sends data or address information to the memory and transistors Q1-Q5, Q7 and Q8 act as TTL to MOS and MOS to TTL logic translators.

5.4.3.6 FAST WAVEFORM DIGITIZER BOARD (OPTION 03).

5.4.3.6.1 The Fast Waveform Digitizer (Figure 5.31) provides for high speed digitizing of analog signals. The circuitry

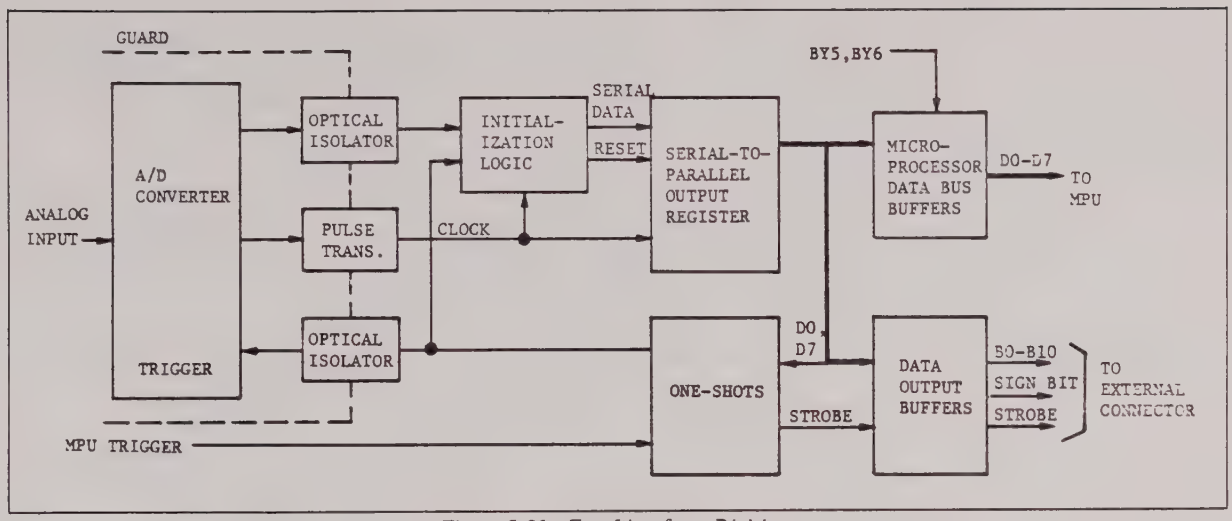


Figure 5.31 - Fast Waveform Digitizer

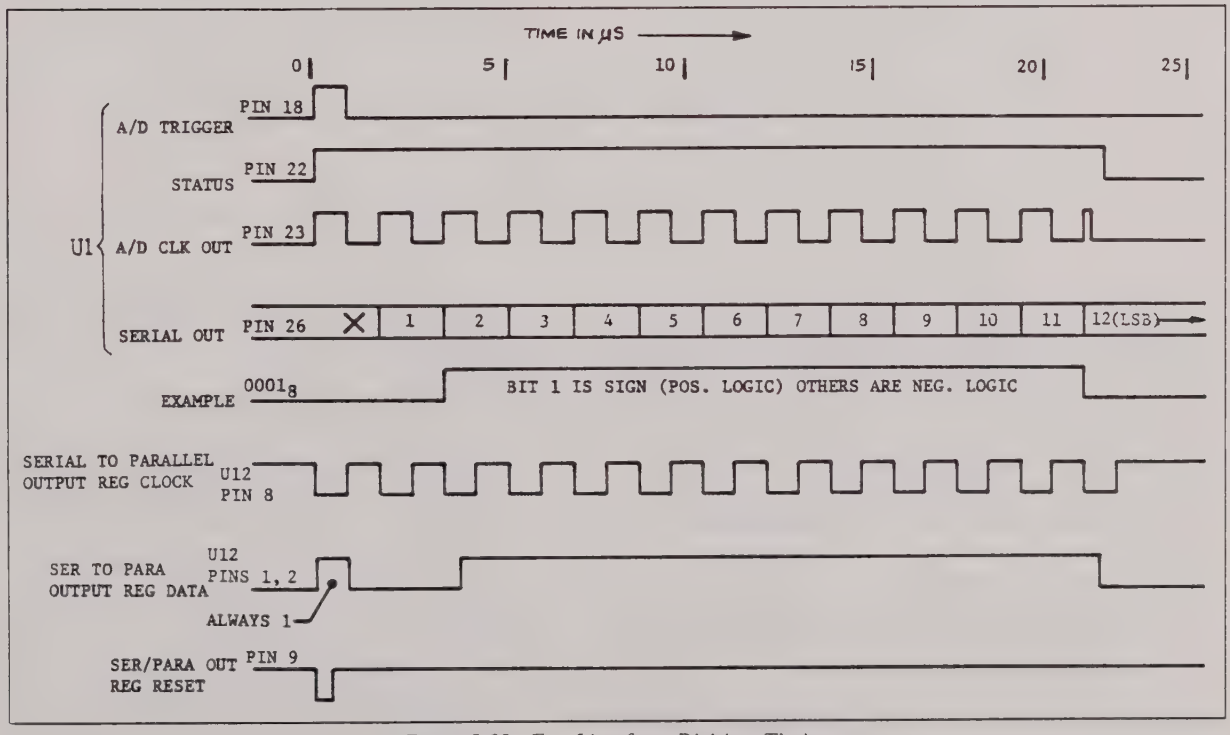


Figure 5.32 - Fast Waveform Digitizer Timing

consists of a 12-bit analog to digital (A/D) converter, initialization logic, serial to parallel output register and data buffers.

5.4.3.6.2 *A/D Converter.* The A/D converter (U1) is connected so that the output ranges between +2047 and −2047 counts. The analog input is scaled as follows for the different ranges: .1 mV/count (100 mV range), 1 mV/count (1 volt range), 10 mV/count (10 volt range), 100 mV/count (100 volt range) and 1V/count (1000 volt range). The digital output is derived from the serial binary output of U1.

5.4.3.6.3 A negative going trigger from either the microprocessor or from an external source starts the conversion sequence by causing pin 8 of U8 to go high. U8, in turn, triggers one shot U7. The Q output of U7 is coupled through U3 and causes one shot U2 to trigger. The Q output of U2 triggers the A/D converter.

5.4.3.6.4 The clock output of the A/D converter is squared (by the second one shot in U2), routed across guard through pulse transformer T1 and applied to the initialization logic at one input of NAND gate U8. The other

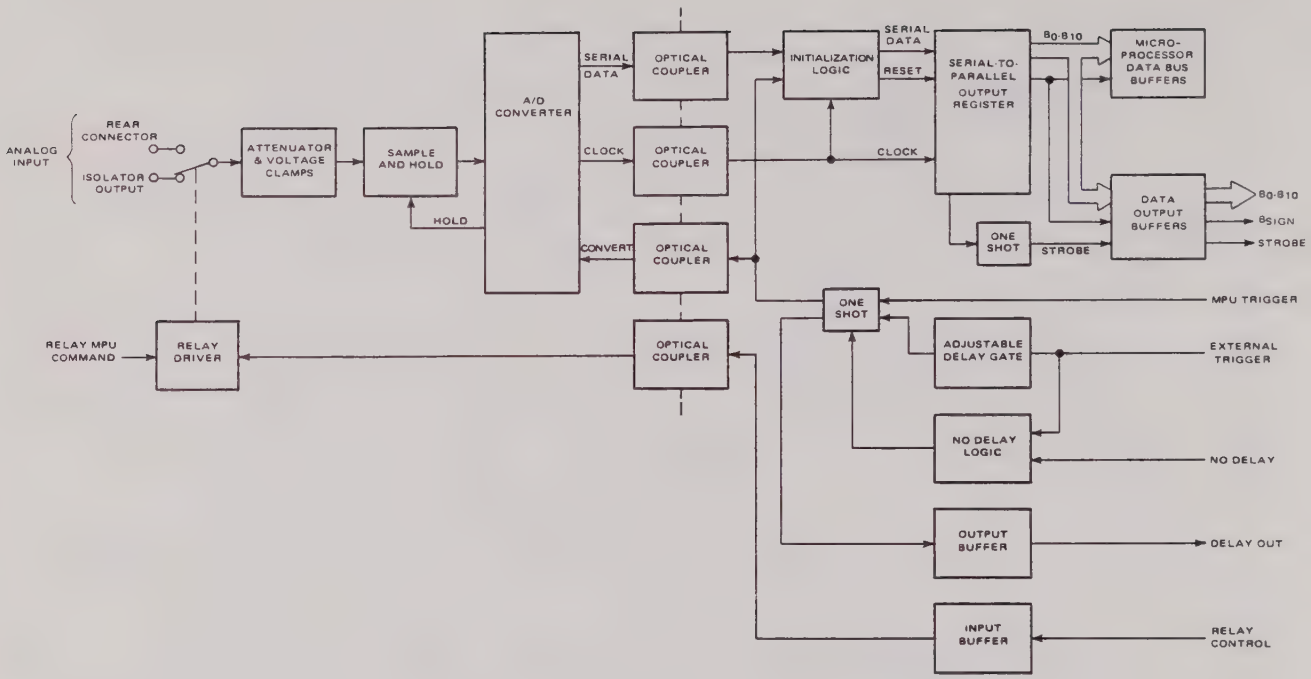


Figure 5.33 - Sample and Hold Fast Waveform Digitizer

input to U8 is the squared equivalent of the trigger pulse (taken from the Q output of U7). The low going output of U8 resets serial to parallel output registers U12 and U14. After the register is reset, a true signal bit is clocked into the serial input of U14, followed by 12 data bits from the A/D converter. When the signal bit reaches position 13 of the registers (U12 pin 10), one shot U7 is triggered and the 12 data bits are strobed through the output buffers. The data bits are also presented to the microprocessor data bus (in two bytes) when BY5 and BY6 are enabled. Digitizer timing is shown in Figure 5.32.

5.4.3.7 FAST WAVEFORM DIGITIZER SAMPLE AND HOLD BOARD (OPTION 03 SH).

5.4.3.7.1 The Sample and Hold (S/H) Digitizer (Figure 5.33) provides for high speed digitizing of analog signals. The S/H circuitry increases the data bandwidth of the Digitizer, and allows for the digitizing of selected portions of input waveforms. The circuitry consists of a Fast A/D Input Select relay, input attenuator, sample and hold section, 12-bit analog to digital (A/D) converter, initialization logic, serial to parallel output register, data buffers, trigger delay gates and relay control circuitry.

5.4.3.7.2 The Fast A/D Input Select relay is a DPDT switch that can be set to select either the voltage from the Isolator output or the voltage applied between pins 24 and 25 of the Fast A/D connector (on the rear panel). The relay can be controlled by a GPIB command or by applying a TTL signal to pin 19 of the Fast A/D connector (TTL low will energize).

5.4.3.7.3 *S/H Circuitry*. The S/H circuitry consists of an input buffer, a JFET switch, a holding capacitor and an output buffer. The selected input signal is routed through the input buffer (AR1) and the JFET switch (Q7) to the holding capacitor (C22). The holding capacitor will track the input voltage until a Convert command is received from the microprocessor or from pin 14 or 15 of the Fast A/D connector. The Convert command is coupled through opto-isolator OCI-2 to pin 18 of A/D converter U1. U1 then sends out a Hold command on pin 22 which opens the JFET switch. With the JFET switch open, the voltage to the A/D converter (from output buffer AR2) will remain at the level stored in C22 until the conversion process is completed.

5.4.3.7.4 *Trigger Delay*. The trigger delay circuitry consists of a delay time one shot and the delay logic. The delay time one shot (1/2 U9) has a delay time output of 2μs to 20μs (adjusted by R33). If the NO DLY line on the Fast A/D connector is low, then the trigger applied at E6 (TC) or E16 (TD) will bypass the delay time one shot and trigger the 1μs one shot (1/2 U6) directly. If the No Delay line is at TTL high, then the delay time one shot will trigger for the set delay time before triggering U6. A microprocessor Convert command is not affected by the delay time one shot since it triggers U6 directly.

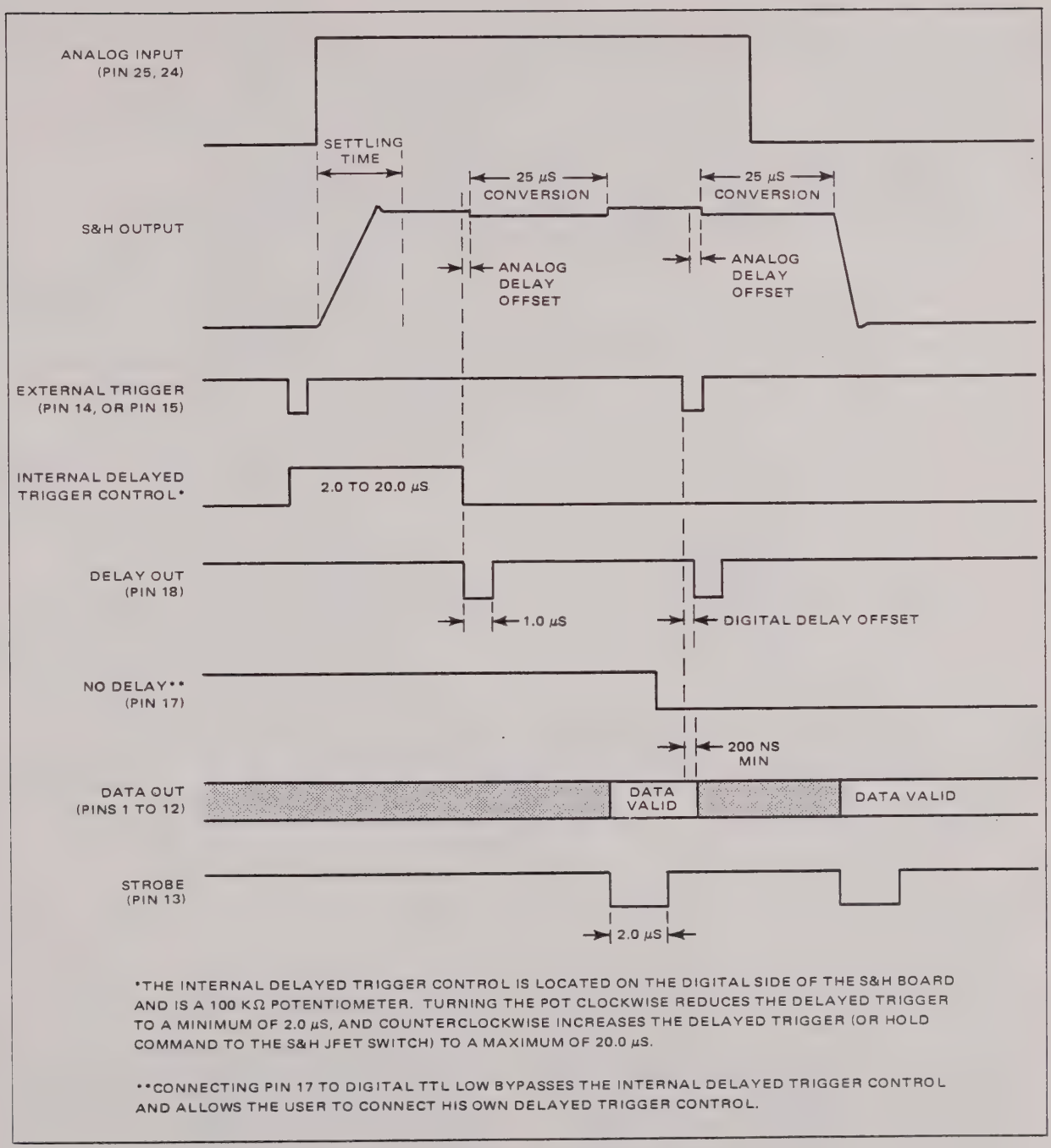


Figure 5.34 - Sample and Hold Digitizer Timing

5.4.3.7.5 *A/D Converter.* The A/D converter (U1) is connected so that the output ranges between +2047 and −2047 counts. The analog input is scaled as follows for the different ranges: .1 mV/count (100 mV range), 1 mV/count (1 volt range), 10 mV/count (10 volt range and voltages applied to the rear input), 100 mV/count (100 volt range) and 1V/count (1000 volt range). The digital output is derived from the serial binary output of U1.

5.4.3.7.6 During the conversion process, the clock output of the A/D converter is routed across guard through opto-isolator OCI-3, squared by one shot U9 and then applied to the initialization logic at one input of NAND gate U7. The other input to U7 is the squared equivalent of the trigger pulse (taken from the Q output of U6). The low going output of U7 resets serial to parallel registers U11 and U13. After the register is reset, a true signal bit is clocked into the

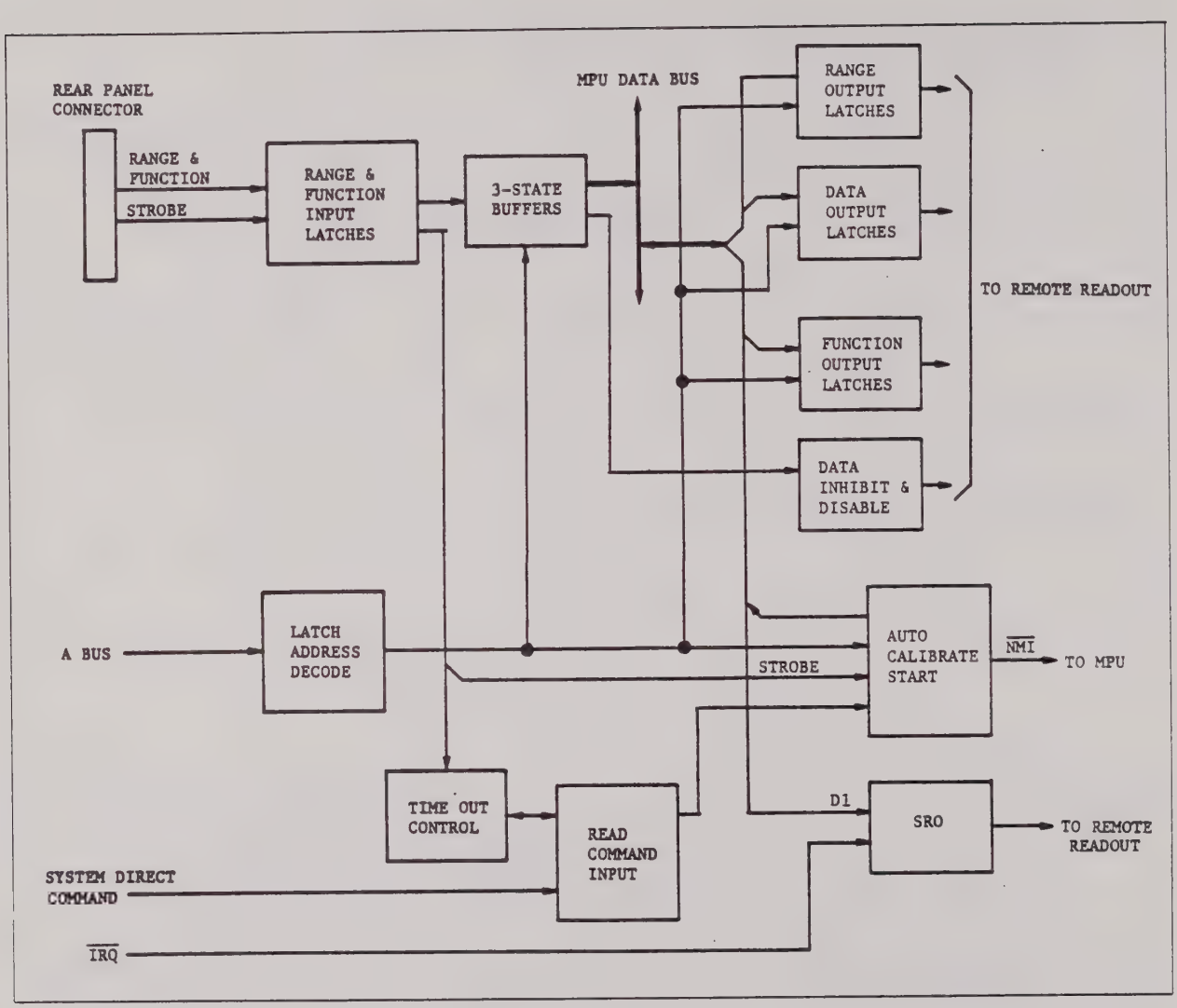


Figure 5.35 - Parallel BCD

serial input of U13, followed by 12 data bits from the A/D converter. When the signal bit reaches position 13 of the registers (U11, pin 10), a one shot (1/2 U6) is triggered and the 12 data bits are strobed through the output buffers. The data bits are also presented to the microprocessor data bus (in two bytes) when BY5 and BY6 are enabled. S/H Digitizer timing is shown in Figure 5.34.

5.5 SYSTEM INTERFACE.

5.5.1 Either of two types of interfaces may be used with the Model 6000. One is the Parallel BCD interface and the other is the General Purpose Interface Bus (GPIB). The GPIB conforms to IEEE Standard 488-1975.

5.5.2 Parallel BCD Interface.

5.5.2.1 The Parallel BCD interface (Figure 5.35) provides for remote programming of function and range. Upon completion of a measurement, the function, range and measurement data are routed through output ports to the remote device.

5.5.2.2 CIRCUIT DESCRIPTIONS.

5.5.2.2.1 The following paragraphs contain descriptions of the Parallel BCD interface circuitry. A detailed schematic may be found in Section 7.

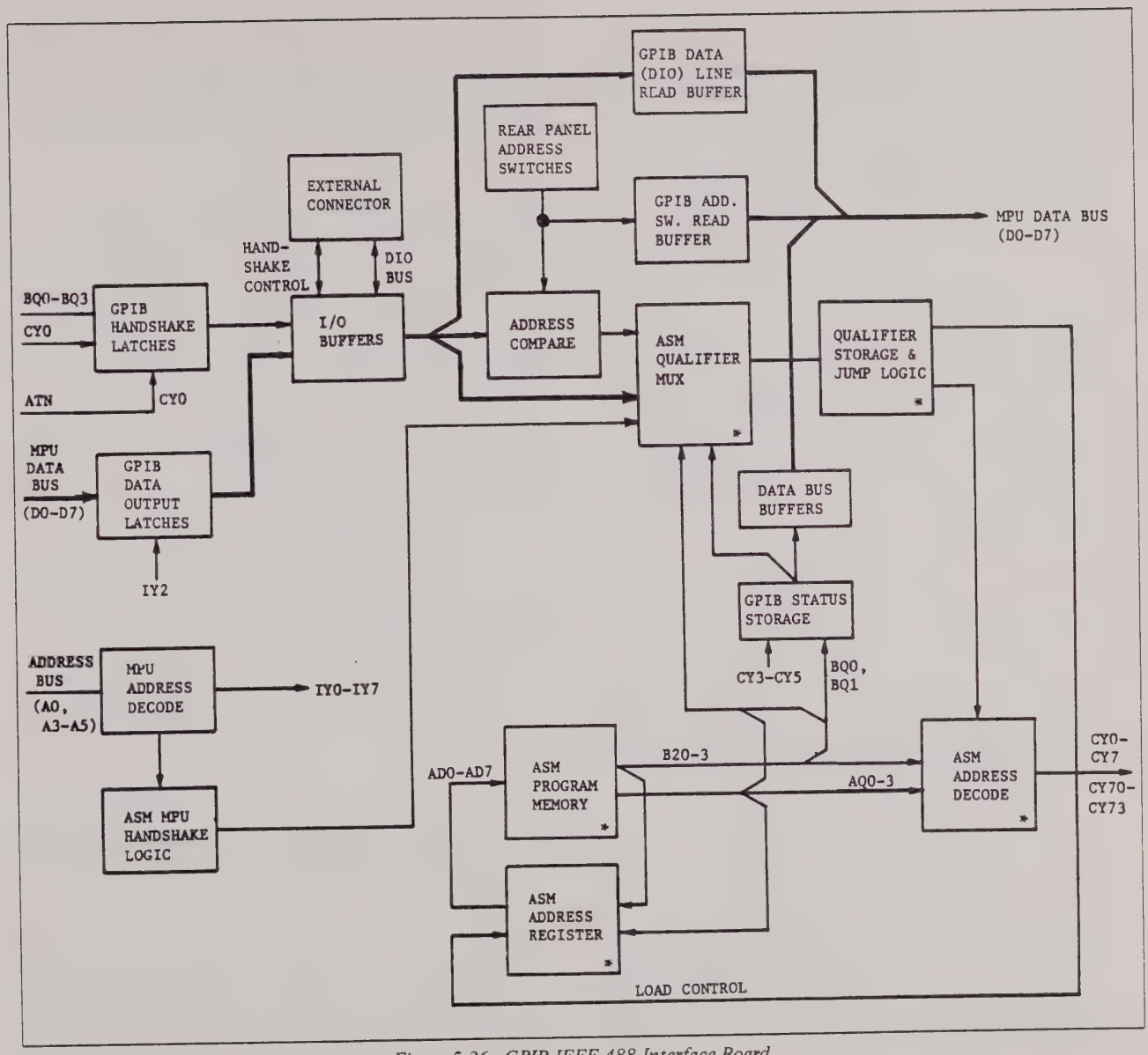


Figure 5.36 - GPIB IEEE-488 Interface Board

5.5.2.2.2 The controller defines the function and range for a measurement, and places this information on the interface lines. After the data has settled on the lines, the controller sends a program strobe which causes the data to be latched into the interface input latches (U17 thru U19). The program strobe also clocks flip-flop U5 in the Auto-Cal start circuit. The NMI signals the microprocessor that data has been stored, and the microprocessor responds by enabling the three state data bus buffers (U14 and U15). After the microprocessor has set the proper range and function, the controller sends a Read command to the interface.

5.5.2.2.3 The particular command sent (Direct, System Direct or Time Out) depends on the requirements of the controller. The Direct command will cause the DMM to take a measurement each time a negative pulse is received by the read command input circuitry (U22, U6 and U8). The System Direct command will cause the DMM to take continuous measurements as long as the command line is held at logical zero. The Time Out command will cause the DMM to take a measurement (after a preset time delay) each time a negative pulse is sent by the controller. The time delay is determined by range and function inputs to the time out control circuitry (U23 and U25).

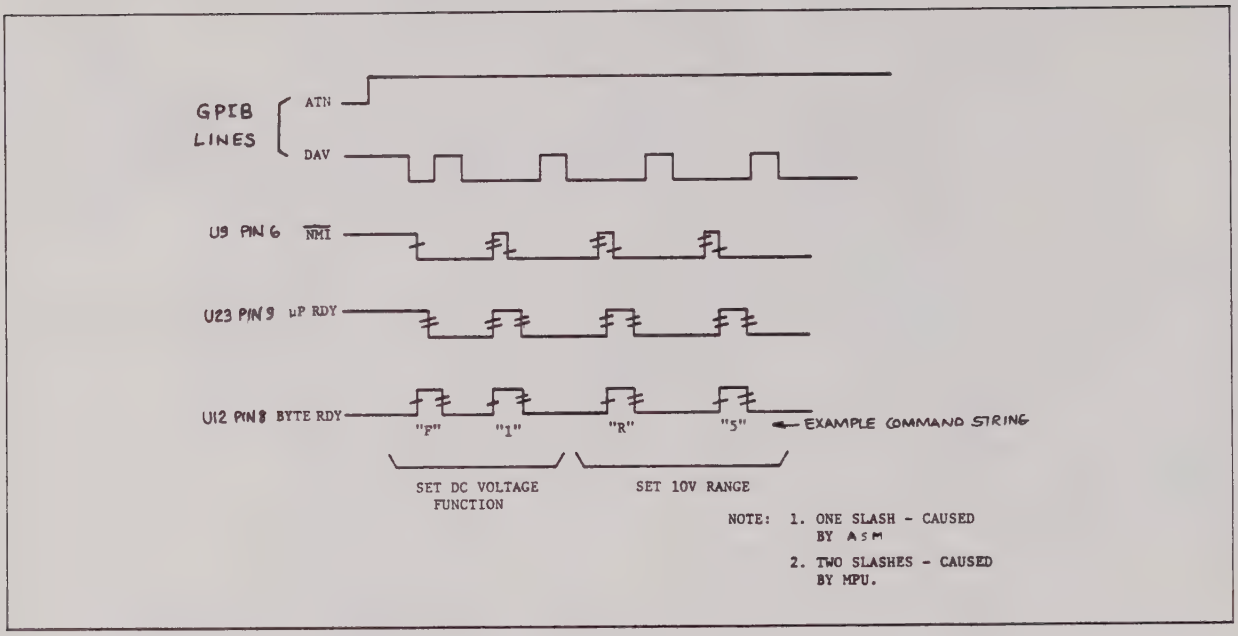


Figure 5.37 - GPIB Data Transfer to MPU

5.5.2.2.4 When a measurement has been completed, the microprocessor loads the range, function and data information into the output latches (U1 thru U3 and U10 thru U12). The latched information is available for local display and is also strobed into a remote readout device.

5.5.3 General Purpose Interface Bus.

5.5.3.1 The GPIB (Figure 5.36) allows the Model 6000 to operate on the IEEE 488 bus with controllers and other instruments. The interface is controlled by its own algorithmic state machine (ASM) which handles all interface commands and allows the GPIB to operate independent of microprocessor control.

5.5.3.2 CIRCUIT DESCRIPTIONS.

5.5.3.2.1 The following paragraphs contain descriptions of the GPIB circuitry. A detailed schematic may be found in Section 7.

5.5.3.2.2 The GPIB employs an 8-bit data bus and 8 lines for communications timing (handshaking) and control. Data is transmitted on the data lines as a series of 8-bit bytes. Data is transferred by means of a handshaking routine that permits asynchronous communication over a wide range of data rates. Bus communication is controlled by five lines that determine how information will be interpreted by devices on the bus. Three handshake lines control data byte transfer and permit synchronization of the transfer on the data bus.

5.5.3.2.3 *ASM.* The ASM is a 256 by 8 bit machine with a microcycle time of 250 nanoseconds. The circuitry consists of the ASM Qualifier Multiplexer, the Qualifier Storage and Jump Logic, the ASM Program Memory, the ASM Address Register and the ASM Address Decoder.

5.5.3.2.4 The ASM can perform two types of instructions: Store Output and Conditional Jump. The Store Output instruction requires one microcycle to complete and allows the ASM to latch the GPIB and ASM/MPU handshake control information. The Store Output instruction also allows the ASM to perform functions such as the setting/resetting GPIB status bits (eg: "Talker", "Listener" and "Remote") and the sending of interupts to the microprocessor via the NMI flip-flop. The Conditional Jump instruction requires two microcycles to complete. During the first microcycle qualifier select and control information, together with a bit indicating the beginning of a two cycle instruction, is made available on the ASM bus. At the end of the first cycle, the qualifier is latched in the Qualifier Storage and Jump Logic flip-flop (U10). During the second cycle, the jump address is placed at the parallel load inputs to the ASM Address Register (U15 and U16). The ASM Address Registers are parallel loadable binary counters which are either loaded or incremented by each clock pulse. The status

of the Qualifier Storage and Jump Logic determines whether or not the jump address is loaded on the succeeding clock pulse. If the jump address is not loaded, the ASM Address Registers will continue to increment as before.

5.5.3.2.5 The GPIB ATN (Attention) line determines how the messages on the Data I/O lines are interpreted. When ATN is low, the bytes sent over the bus are intended for the GPIB board. When ATN is high, the bytes are intended for the microprocessor. In order to receive bytes from the controller, the GPIB board must have been made a listener while ATN was low. The controller does this by sending the GPIB board's listen address on the Data I/O bus. A comparison is made by the ASM with the device address switches on the DMM. If a match occurs, the listen flip-flop (1/2 of U7) in the GPIB Status Storage is set by the ASM.

5.5.3.2.6 If the GPIB board is in the listen state and ATN returns high, the ASM will handshake any bytes made available over the GPIB. The GPIB board will then send an interrupt to the microprocessor, indicating that a byte is ready for the microprocessor. The microprocessor takes the byte and the ASM sets the Byte Ready line low. When the microprocessor is ready for another byte, it will set the MPU Ready line high and the ASM will transfer another byte of data. Figure 5.37 illustrates the timing relationships.

5.5.3.2.7 When ATN goes low, the GPIB board must respond within 200 nanoseconds. This is accomplished by having ATN reset the four control lines: Not Ready For Data (NRFD), Data Valid (DAV), No Data Accepted (NDAC) and Attention Latch (ATNL). This meets the IEEE-488 Standard and prevents the controller from sending data until the ASM program has a chance to execute the attention routine. The ASM program then starts the handshaking routine.

5.5.3.2.8 If, with ATN low, the ASM recognizes a byte from the controller as being its talk address, the talk flip-flop (1/2 of U7) is set and the ASM handshakes any other interface commands. The microprocessor will recognize the talk state and will take readings in the function called. The data is passed on the microprocessor data bus (D0 through D7) and stored in the GPIB Data Output Latches (U5 and U6). The microprocessor then sets the Next Byte Available (NBA) flip-flop (1/2 of U23), indicating that another data byte is ready. After the ASM outputs the next byte, it resets the NBA flip-flop which signals the microprocessor that it can load another data byte.

5.5.3.2.9 The GPIB Address Switch Read Buffer (U17) is used to provide a front panel display of the address set on the rear panel address switches.

SECTION 6 MAINTENANCE

6.1 INTRODUCTION.

6.1.1 This section contains information required to maintain the Model 6000. Signal flow diagrams and test point standards are provided to facilitate performance checks and troubleshooting.

6.1.1.1 For the convenience of the user during maintenance or field installation of options, the Model 6000 has an option label affixed to the transformer cover on the rear panel. It indicates the location of all option assemblies for that unit.

Option	Function	Location of Unique Assy
—	AC rms	Cal Module
—	488 Interface	Mainframe
—	Ohms	Cal Mod./Mainfr.
03SH	H.S. Digitizer	Mainframe
04	50 Hz line	Mainframe
09	Ratio Switch	Cal Module
11	Ref AC rms	Cal Module
14	AC avg	Cal Module
34	4 W Ratio	Cal Module
41	10mV/1Ω	Mainframe
59	BCD Interface	Mainframe
60	Rack Mount	Mainframe
66	Slide Mount	Mainframe
71	220/240 line	Mainframe

6.2 CALIBRATION CHECKS AND PROCEDURES.

6.2.1 Detailed procedures for maintaining the calibration specifications of the Model 6000 are contained in the Operators Manual.

6.3 MAINTENANCE DISASSEMBLY.

WARNING

Removal of covers exposes potentially lethal voltages. Avoid contact with internal electrical connections while unit is connected to AC Power source.

6.3.1 Access to the DMM circuitry may be made as follows (reference Figure 6.1):

a. Unplug power cord from AC Power source.

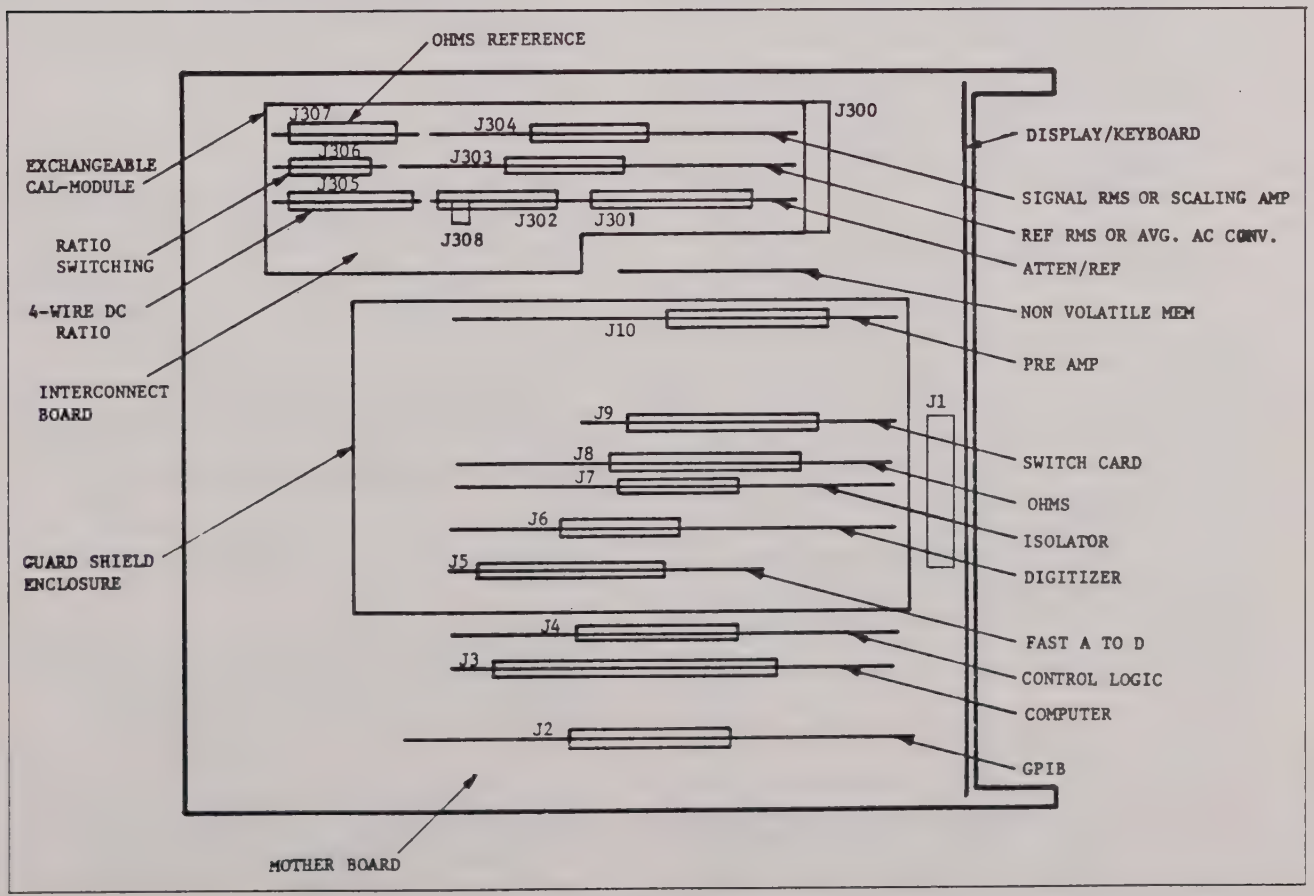


Figure 6.1 - PC Board Locations

Table 6.1 - Recommended Test Equipment

Function	Qty	Item	Minimum Use Specifications	Suggested Equipment
DC	(2)	DC Voltages Sources	0.1 ppm resolution	FLUKE 332B
	(2)	Voltage Divider, Adjustable	0.1 ppm linearity	FLUKE 720A
	(1)	10:1 Voltage Divider, Fixed	1 ppm, Output Z $\leq$ 10 K ohms	ESI RV622, With corrections
AC	(1)	AC Voltage Source	1 ppm resolution	HP745A/746A
OHMS	(8)	Resistance Standards		
		10Ω	10 ppm	ESI SR1 with corrections
		100Ω	5 ppm	ESI SR1 with corrections
		1KΩ	5 ppm	ESI SR1 with corrections
		10KΩ	5 ppm	ESI SR1 with corrections
		100KΩ	5 ppm	ESI SR1 with corrections
		1MΩ	5 ppm	ESI SR1 with corrections
		10MΩ	20 ppm	ESI SR1 with corrections
		100MΩ	80 ppm	Fabricated
Other	(1)	Digital Voltmeter, 5 1/2 Digits	Input R $\geq$ 10,000 MΩ on 10VDC Range	Racal-Dana 6000 or 5900
	(1)	Oscilloscope	50 MHz Bandwidth 5mV/cm Sensitivity	Tektronix 454

b. Remove the instrument top cover by loosening the four securing screws.

c. Remove the guard shield top cover by loosening the four securing screws.

d. Loosen the rear panel thumbscrew that secures the Cal-Module.

e. Slide the Cal-Module out of the Model 6000.

f. Remove the Cal-Module top cover by loosening the five securing screws.

g. Slide the Cal-Module back into the Model 6000 and tighten the rear panel thumbscrew.

6.3.2 PC Board Removal.

6.3.2.1 All of the printed circuit boards (except the Non-Volatile Memory board and Display board) may be unplugged from the motherboard connectors as required.

6.3.2.2 NON-VOLATILE MEMORY BOARD REMOVAL.

6.3.2.2.1 The Non-Volatile Memory board may be removed as follows:

a. Remove the Cal-Module by loosening the thumbscrew on the rear panel. Slide the Cal-Module out of the Model 6000.

b. Remove the Non-Volatile Memory board by loosening the four securing screws.

6.3.2.3 DISPLAY BOARD REMOVAL.

6.3.2.3.1 The Display board may be removed as follows:

a. Remove the four top and five bottom front panel assembly securing screws.

b. Remove the front panel assembly from the 6000. Take care not to put excessive stress on the wires connected to the AC Power switch.

c. Remove the Display board from the front panel assembly by loosening the six securing screws.

6.4 UNIT PERFORMANCE CHECKS.

WARNING

Removal of covers exposes potentially lethal voltages. Avoid contact with internal electrical connections while unit is connected to AC Power source.

6.4.1 This section contains unit performance checks for each basic function and range of the Model 6000. Signal flow diagrams and test point standards are also provided to facilitate troubleshooting.

6.4.2 Test points called out in the performance checks may refer to physical test points provided in the circuitry or to component connections. The test point identifiers appear in the performance check tables as black squares (voltage test points) and black diamonds (waveform test points).

6.4.3 Subassembly performance checks are designed to aid in the isolation of malfunctioning components. Test points are numbered and lettered sequentially for each board so that the signal may be traced from the input to the output of the board.

6.4.4 Recommended Test Equipment.

6.4.4.1 Test equipment recommended for performance checks and troubleshooting is listed in Table 6.1. Equivalent test equipment may be substituted, where desired.

6.4.4.2 CALIBRATION/MAINTENANCE TEST BED.

6.4.4.2.1 The Calibration/Maintenance Test Bed may be used to facilitate calibration, troubleshooting and repair of plug-in circuit boards and the Cal-Module. The Test Bed is electronically identical to the Model 6000 (except for the absence of a Cal-Module) and the front panel is designed to simplify maintenance procedures. A complete description of the Test Bed is contained in the Operators Manual.

6.4.5 Power Supply Check.

6.4.5.1 Before proceeding with the unit performance checks, ensure that the various power supply voltages are present and correct (reference Table 6.2). If a discrepancy is found, reference the test procedures in the following paragraphs.

6.4.5.2 NO SUPPLY VOLTAGES.

6.4.5.2.1 Ensure that the AC power cord is connected to the proper voltage source and that the front panel power switch is set ON. If all supplies still remain at zero, proceed as follows:

a. Disconnect the AC power cord from the power source.

b. Remove the fuse from the rear panel fuseholder and check its condition with an ohmmeter. If the fuse is open, replace with one of the proper rating for the selected operating voltage, and place back in the fuseholder.

c. Reconnect the AC power cord and recheck the supply voltages. If the problem persists, check the power supply components.

6.4.5.3 INCORRECT SUPPLY VOLTAGES.

6.4.5.3.1 Ensure that the AC power cord is connected to the proper voltage source. If incorrect supply voltages are still noted, proceed as follows:

a. Disconnect the AC power cord from the power source.

b. Remove all plug in boards to eliminate possible source of shorts.

c. Reconnect the AC power and recheck the supply voltages. If voltages return to proper levels, check the plug in boards for shorts. If the voltages do not return to normal levels, check the Motherboard circuitry for shorts and the power supply for bad components.

6.4.6 Error Messages.

NOTE

The Series 6000 contains two sets of error limits for readings taken during Auto-Cal.

Errors 61 thru 76 are Predictive Maintenance errors and **do not** indicate an operating condition that is out-of tolerance. They indicate instead that the Auto-Cal sequence has corrected for conditions that are beyond the normal design tolerances expected with the Series 6000. To prevent possible future failure or performance that is out-of-specification, the unit should be referred for maintenance when convenient.

Errors 81 thru 96 indicate a failure or a condition that is out-of-specification, and with the unit "locking-up" on the first error encountered.

Additional diagnostic errors may be observed by pressing any key on the Series 6000 keyboard.

6.4.6.1 Error messages and their descriptions are listed in Table 6.3. References are made in the Auto-Cal message descriptions to the singlethread troubleshooting diagrams in Figures 6.3 thru 6.17. These diagrams, in conjunction with the function unit performance tests in Tables 6.9 and 6.10, will aid in the location of defective circuitry. In the event that a lockup condition occurs (error messages 81 thru 99), the lockup may be bypassed, for troubleshooting purposes, by pressing any key on the Model 6000 keyboard.

6.4.7 Troubleshooting Charts.

6.4.7.1 The following troubleshooting charts are presented as an aid in the isolation of malfunctions to individual sub-assemblies. References are made in the charts to the unit performance tests for these subassemblies.

Table 6.2 - Power Supply Checks

Input and Control Setting	Signal Nomenclature	Reference Designation	Test Point	Illustration Reference	Performance Standard
Power Switch On	All digital supplies are referenced to Digital Ground. All analog supplies are referenced to MECCA.				
	Display +5V output	U1-3	1	Figure 6.2	Voltage level varies according to display load
	M.B. +5V output	E43	2	Figure 6.2	+5V
	TTL +5	E34	3	Figure 6.2	+5V
	Calibration memory –30V output	Q1-1	4	Figure 6.2	–30V
	Analog +5V output	U14-3	5	Figure 6.2	+5V
	Analog +15V output	U15-3	6	Figure 6.2	+15V
	Analog –15V output	U12-3	7	Figure 6.2	–15V
	Analog +30V UNREG output	U11-1	8	Figure 6.2	+30V to +45V
	Relay Coil +24V output	U11-3	8	Figure 6.2	+24V
	Analog –30V UNREG	U13-2	9	Figure 6.2	–30V to –45V
	Analog –24V output	U13-3	9	Figure 6.2	–24V
	Analog –40V	CR3, CR4	10	Figure 6.2	–40 to –85V

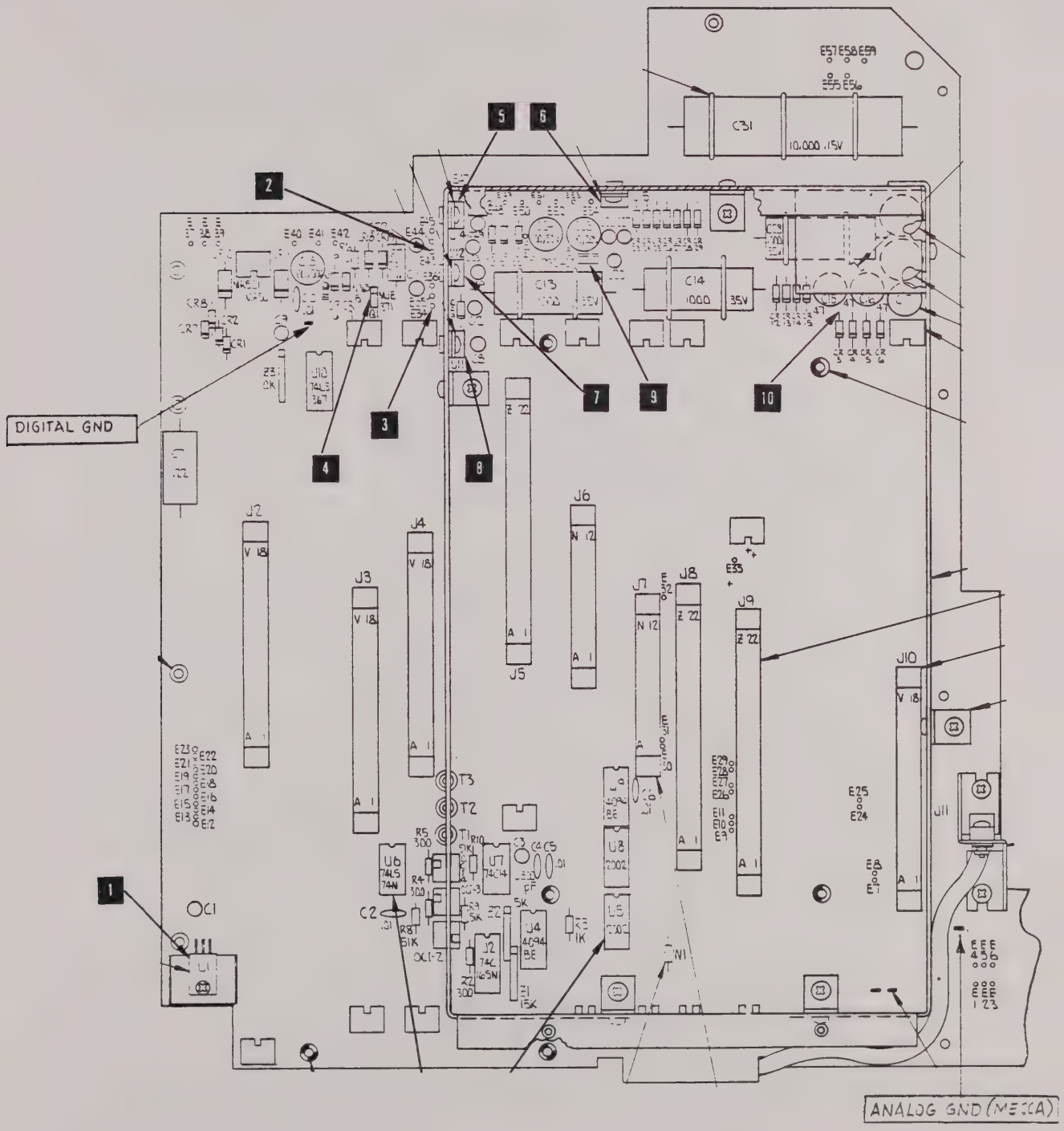


Figure 6.2 - Main Logic Component Location Diagram

Table 6.3 - Error Messages

Error Number	Description
0	Cannot calculate Log of zero
2	Attempted Auto-cal when in 1000V signal or reference range
10	Improper Key sequence
11	Illegal # digits request
12	Divide by zero
13	Exponent cannot be displayed when in 6 1/2 digit mode
14	Display exponent beyond ±9
20	Required board missing from main analog section
21	Required board missing from CAL module
22	Signal RMS converter not installed
23	Reference RMS converter not installed
24	AC converter not installed
25	Ohms converter not installed
26	4-wire DC external reference not installed
29	Fast Digitizer not installed
30	RAM failure on computer board
31	DC or reference Non Vol number out of spec
32	Ohms Non Vol number out of spec
33	Non Vol will not write or Cal switch bad
34	Clock on Non Vol board not oscillating
35	Reading will not trigger on control logic board
36	No axis crossing detected from Integrator board
	PREDICTIVE MAINTENANCE ERRORS (See Tables 6.4 to 6.8)
	Auto-Cal reading taken during:
61	DC CAL 1 (Isolator/Digitizer - Positive Reference Voltage - See Figure 6.12)
62	DC CAL 2 (Attenuator - Positive Reference Voltage - See Figure 6.13)
63	DC CAL 3 (Isolator/Digitizer - Negative Reference Voltage - See Figure 6.14)
64	DC CAL 4 (Attenuator - Negative Reference Voltage - See Figure 6.15)
65	DC CAL 5 (10 Volt Range - See Figure 6.3)
66	DC CAL 6 (1 Volt Range - See Figure 6.4)
67	DC CAL 7 (100 mV Range - See Figure 6.4)
68	DC CAL 8 (10mV Range - See Figure 6.6)
71	OH CAL 1 (10Ω Range - See Figure 6.9)
72	OH CAL 2 (100Ω, 1KΩ Ranges - See Figure 6.8)
73	OH CAL 3 (10KΩ - 100MΩ Ranges - See Figure 6.7)
74	OH CAL 4 (Input Bias Current - See Figure 6.16)
75	OH CAL 5 (Internal 10K Reference Resistor - See Figure 6.17)
76	OH CAL 6 (1Ω Range - See Figure 6.10)

Table 6.3 - Error Messages continued

Error Number	Description
	DIAGNOSTIC ERRORS (See Tables 6.4 to 6.8)
	Incorrect Auto-Cal reading taken during:
81	DC CAL 1 (Isolator/Digitizer - Positive Reference Voltage - See Figure 6.12)
82	DC CAL 2 (Attenuator - Positive Reference Voltage - See Figure 6.13)
83	DC CAL 3 (Isolator/Digitizer - Negative Reference Voltage - See Figure 6.14)
84	DC CAL 4 (Attenuator - Negative Reference Voltage - See Figure 6.15)
85	DC CAL 5 (10 Volt Range - See Figure 6.3)
86	DC CAL 6 (1 Volt Range - See Figure 6.4)
87	DC CAL 7 (100mV Range - See Figure 6.4)
88	DC CAL 8 (10mV Range - See Figure 6.6)
91	OH CAL 1 (10Ω Range - See Figure 6.9)
92	OH CAL 2 (100Ω, 1KΩ Ranges - See Figure 6.8)
93	OH CAL 3 (10KΩ - 100MΩ Ranges - See Figure 6.7)
94	OH CAL 4 (Input Bias Current - See Figure 6.16)
95	OH CAL 5 (Internal 10K Reference Resistor - See Figure 6.17)
96	OH CAL 6 (1Ω Range - See Figure 6.10)

Table 6.4 - Troubleshooting Chart - General

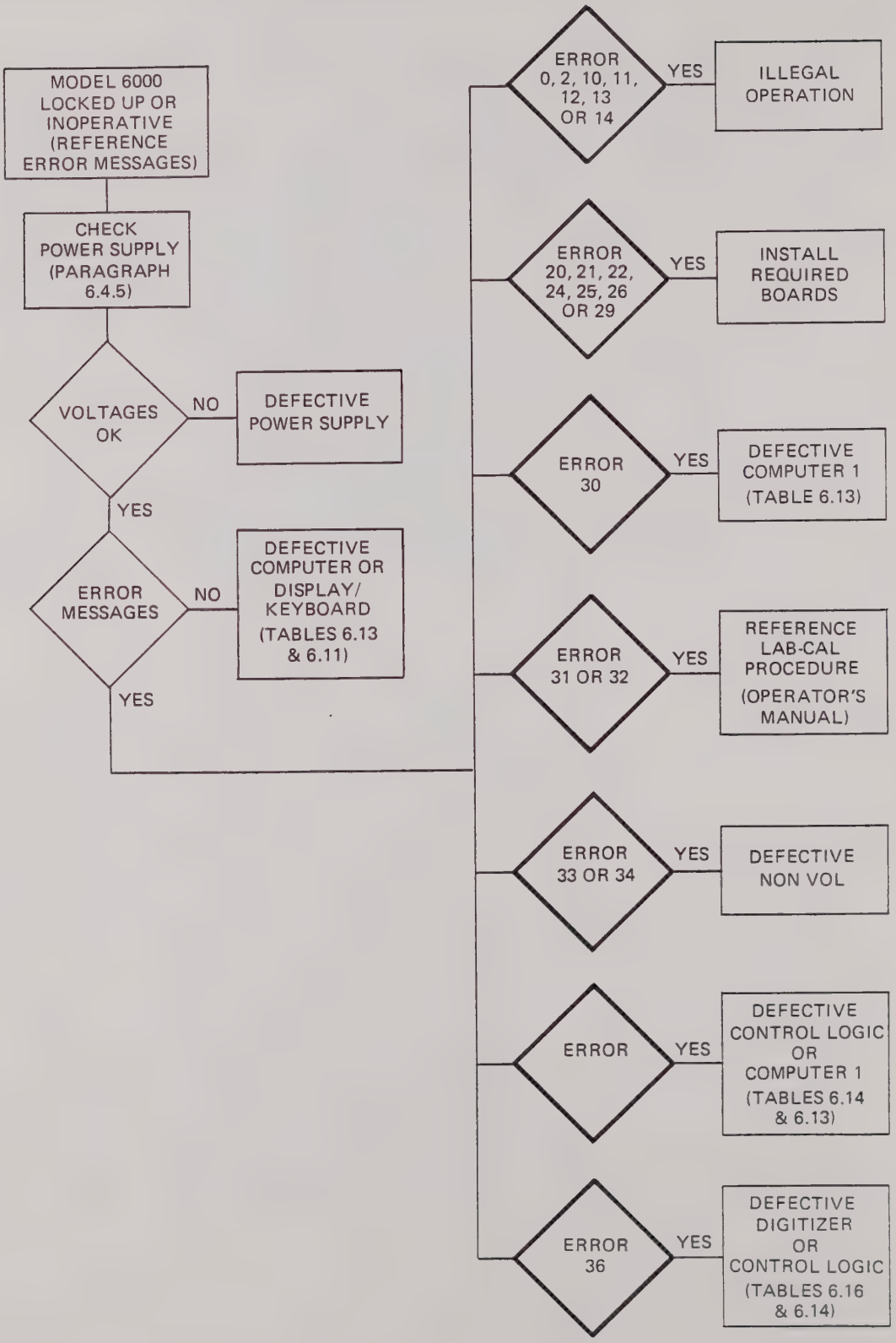


Table 6.5 - Troubleshooting Chart - DC Voltage

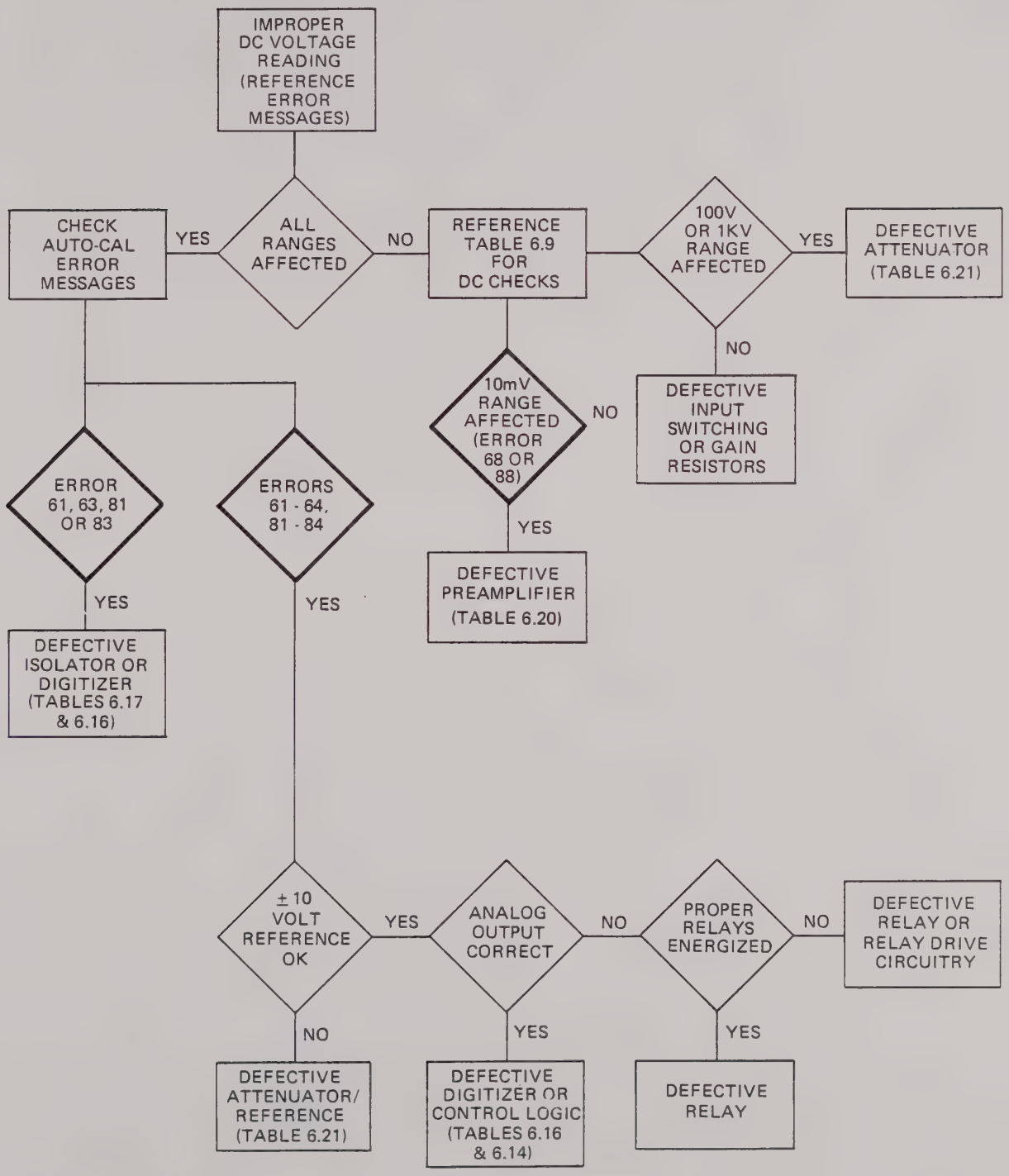


Table 6.6 - Troubleshooting Chart - AC Voltage

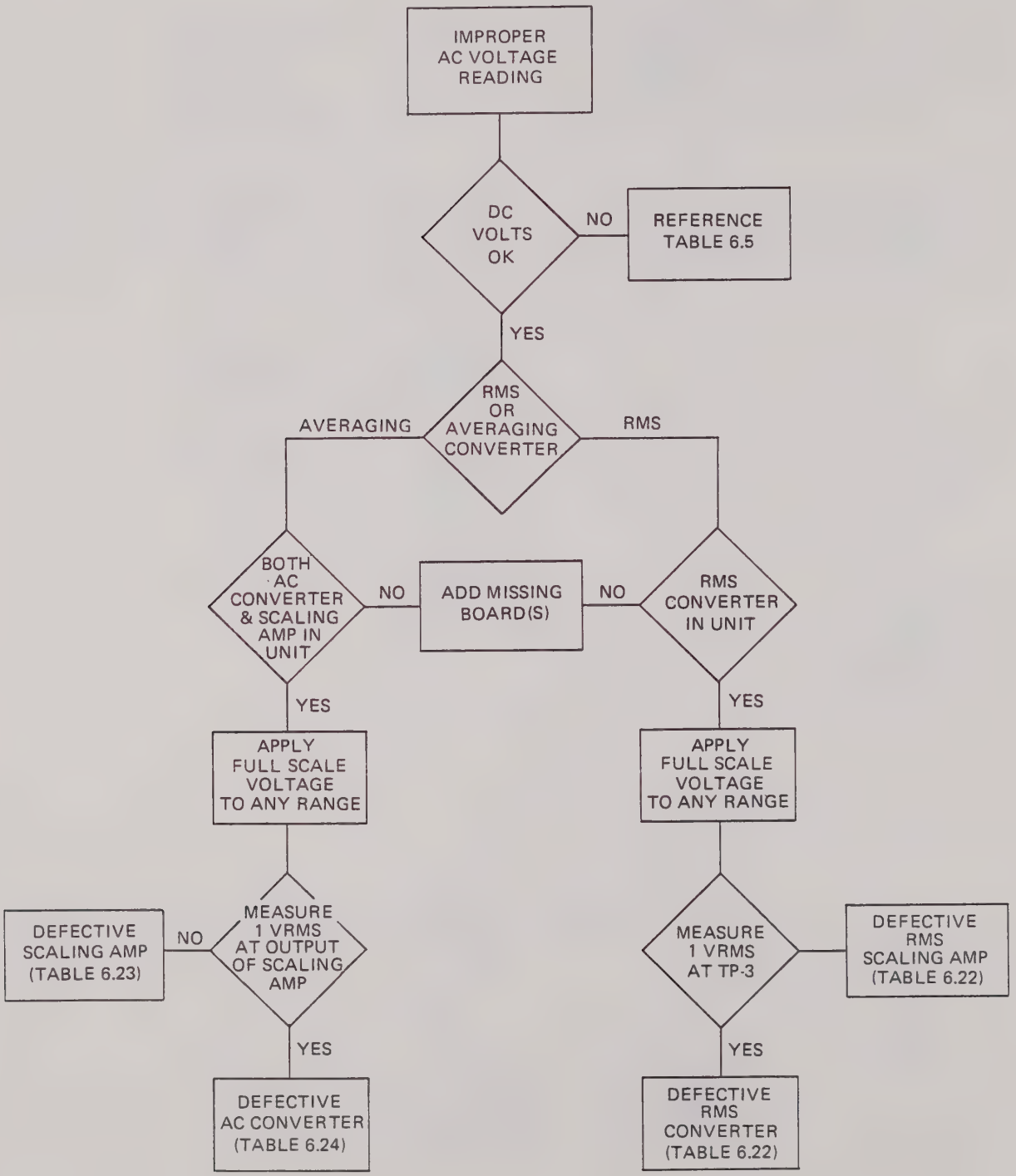


Table 6.7 - Troubleshooting Chart - Ohms

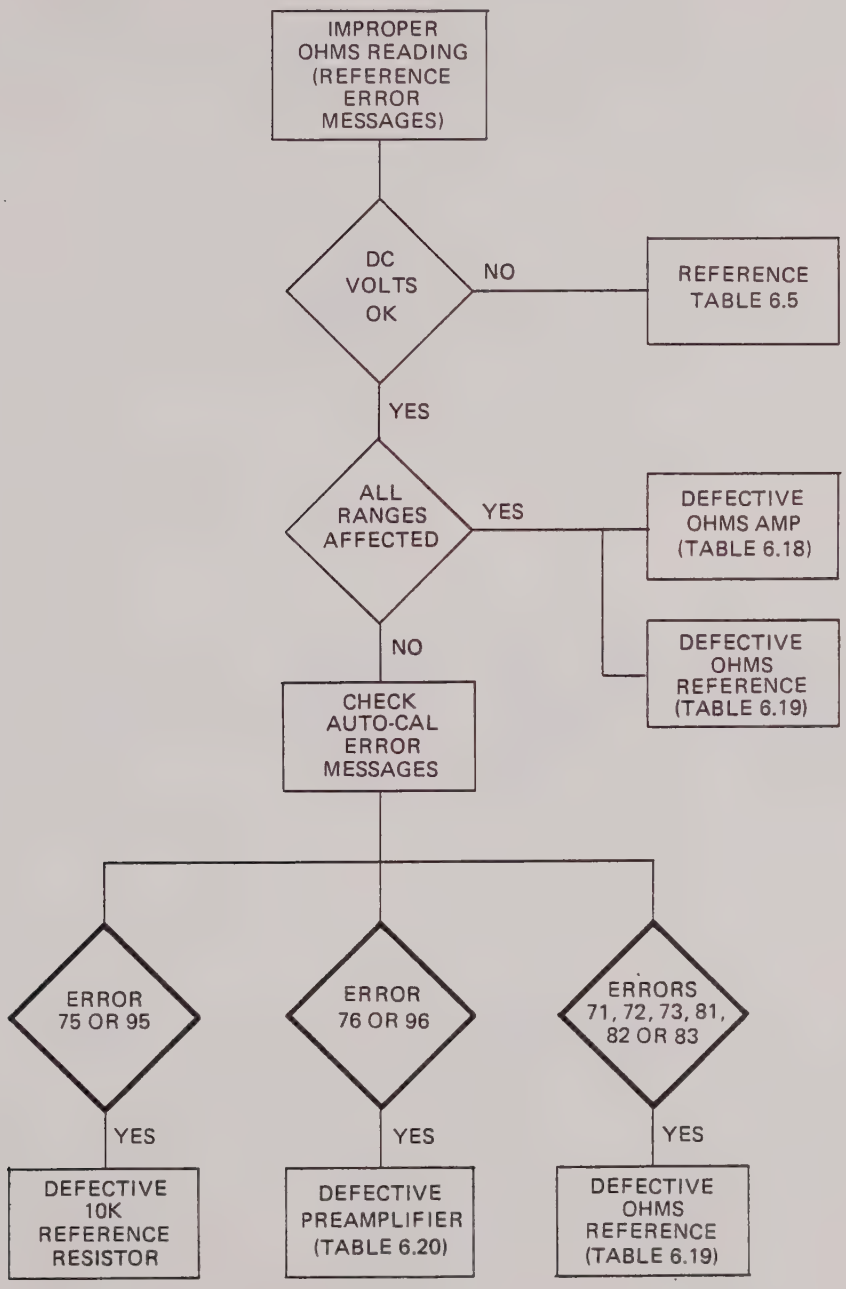


Table 6.8 - Troubleshooting Chart - Remote Programming

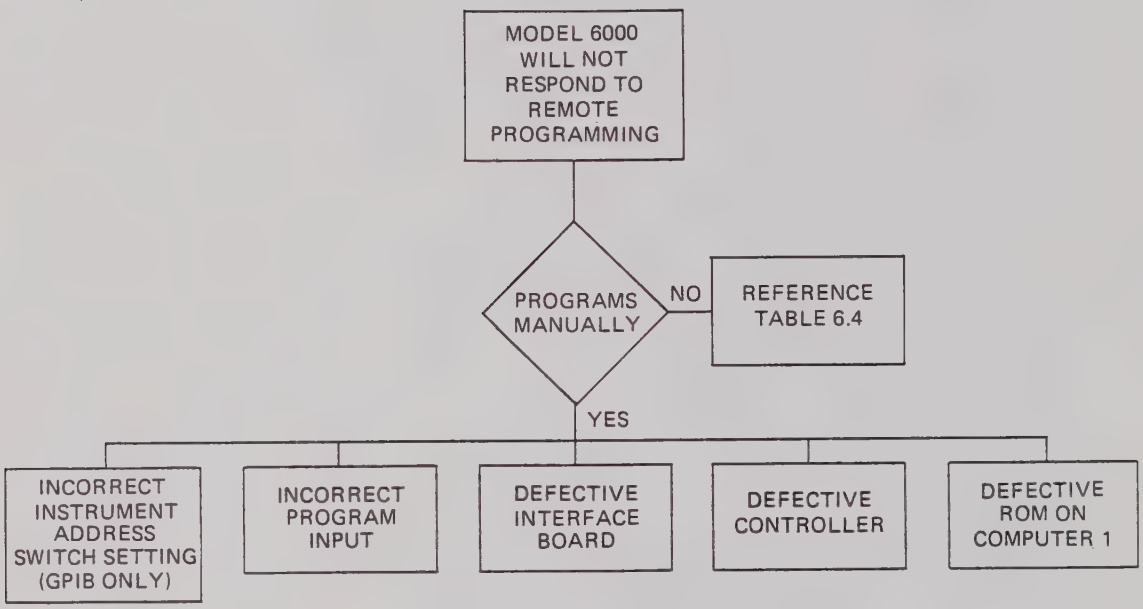


Table 6.9 - DC Voltage Unit Performance Tests

Input and Control Setting	Signal Nomenclature	Reference Designation	Test Point	Illustration Reference	Performance Standard
Function: DC Voltage Range: 10 VDC Input: 10 VDC	All measurements are referenced to Analog Common (Mecca).				
	Isolator + input	J7-A	1	Figure 6.3	+10.0 VDC
	Isolator – input	TP1	2	Figure 6.3	+10.0 VDC
	Isolator output	TP2	3	Figure 6.3	+10.0 VDC
Function: DC Voltage Range: 100 mVDC Input: 100 mVDC					
	Isolator + input	J7-A	1	Figure 6.4	+0.1 VDC
	Isolator – input	TP1	2	Figure 6.4	+0.1 VDC
	Isolator output	TP2	3	Figure 6.4	+10.0 VDC
Function: DC Voltage Range: 1 VDC Input: 1 VDC					
	Isolator + input	J7-A	1	Figure 6.4	+1.0 VDC
	Isolator – input	TP1	2	Figure 6.4	+1.0 VDC
	Isolator output	TP2	3	Figure 6.4	+10.0 VDC
Function: DC Voltage Range: 100 VDC Input: 100 VDC					
	Isolator + input	J7-A	1	Figure 6.5	+10.0 VDC
	Isolator – input	TP1	2	Figure 6.5	+10.0 VDC
	Isolator output	TP2	3	Figure 6.5	+10.0 VDC

Table 6.9 - DC Voltage Unit Performance Tests (Continued)

Input and Control Setting	Signal Nomenclature	Reference Designation	Test Point	Illustration Reference	Performance Standard
Function: DC Voltage Range: 1000 VDC Input: 1000 VDC	Isolator + input	J7-A	1	Figure 6.5	+10.0 VDC
	Isolator – input	TP1	2	Figure 6.5	+10.0 VDC
	Isolator output	TP2	3	Figure 6.5	+10.0 VDC
Function: DC Voltage Range: 10 mVDC Input: 10 mVDC	Isolator + input	J7-A	1	Figure 6.6	+7.2 VDC
	Isolator – input	TP1	2	Figure 6.6	+7.2 VDC
	Isolator output	TP2	3	Figure 6.6	+7.2 VDC
	Preamplifier + input	E4	4	Figure 6.6	+10 mVDC
	Preamplifier output	E3	5	Figure 6.6	+7.2 VDC
	Preamplifier – input	E7	6	Figure 6.6	+10 mVDC

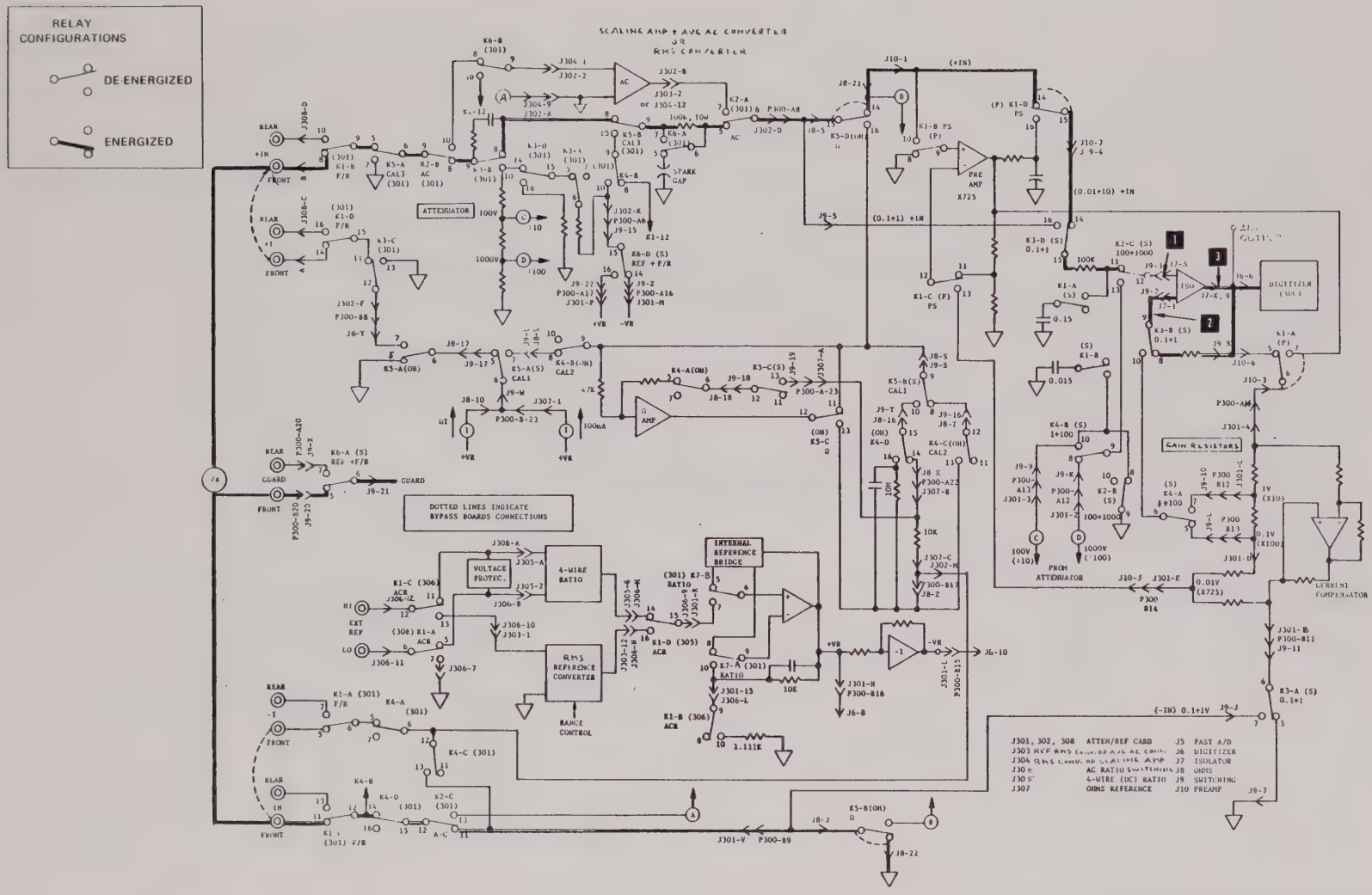


Figure 6.3 - 10 Volt DC Range Singlethread Troubleshooting Diagram

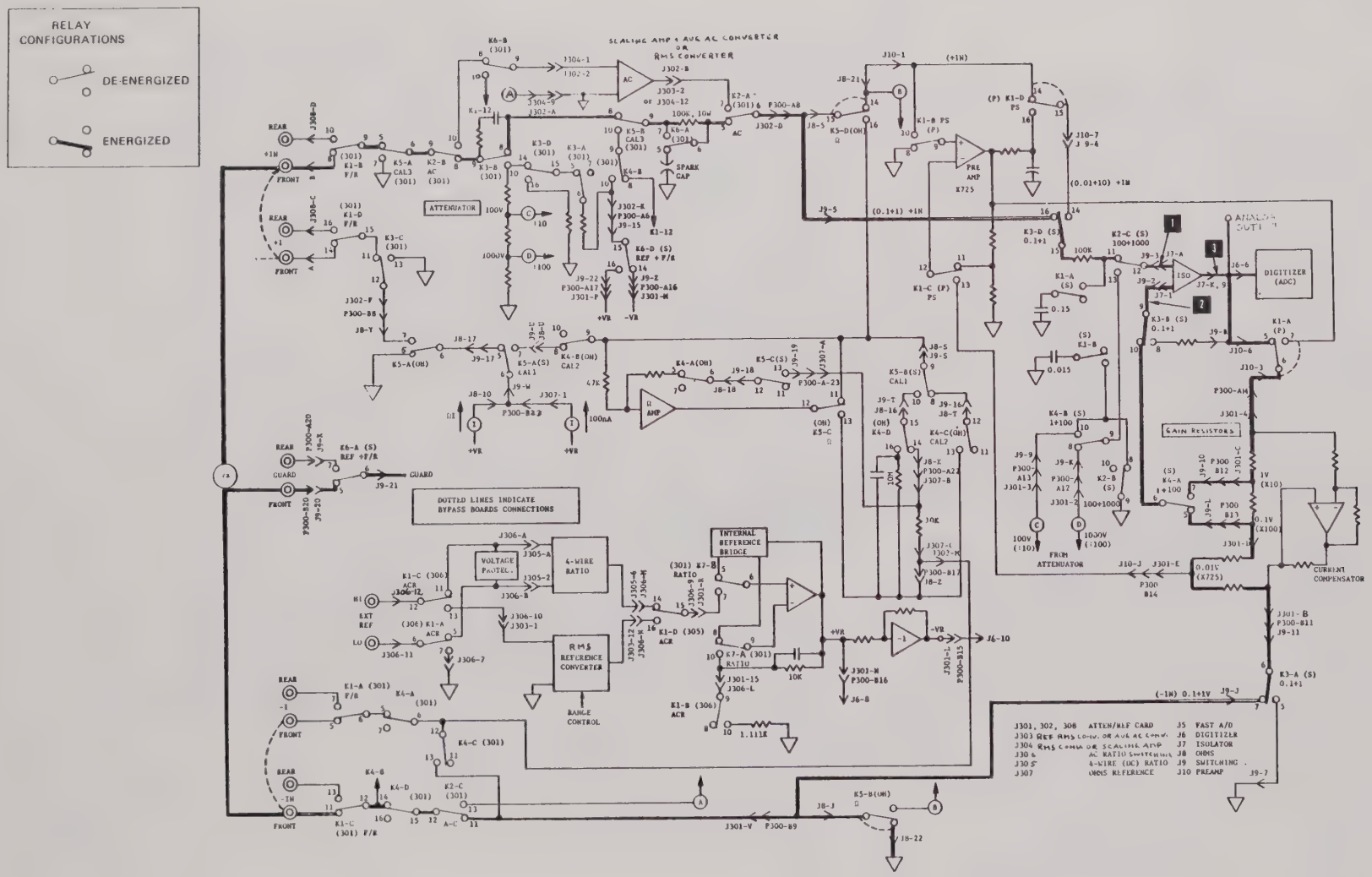


Figure 6.4 - 100mV and 1 Volt DC Range Singlethread Troubleshooting Diagram

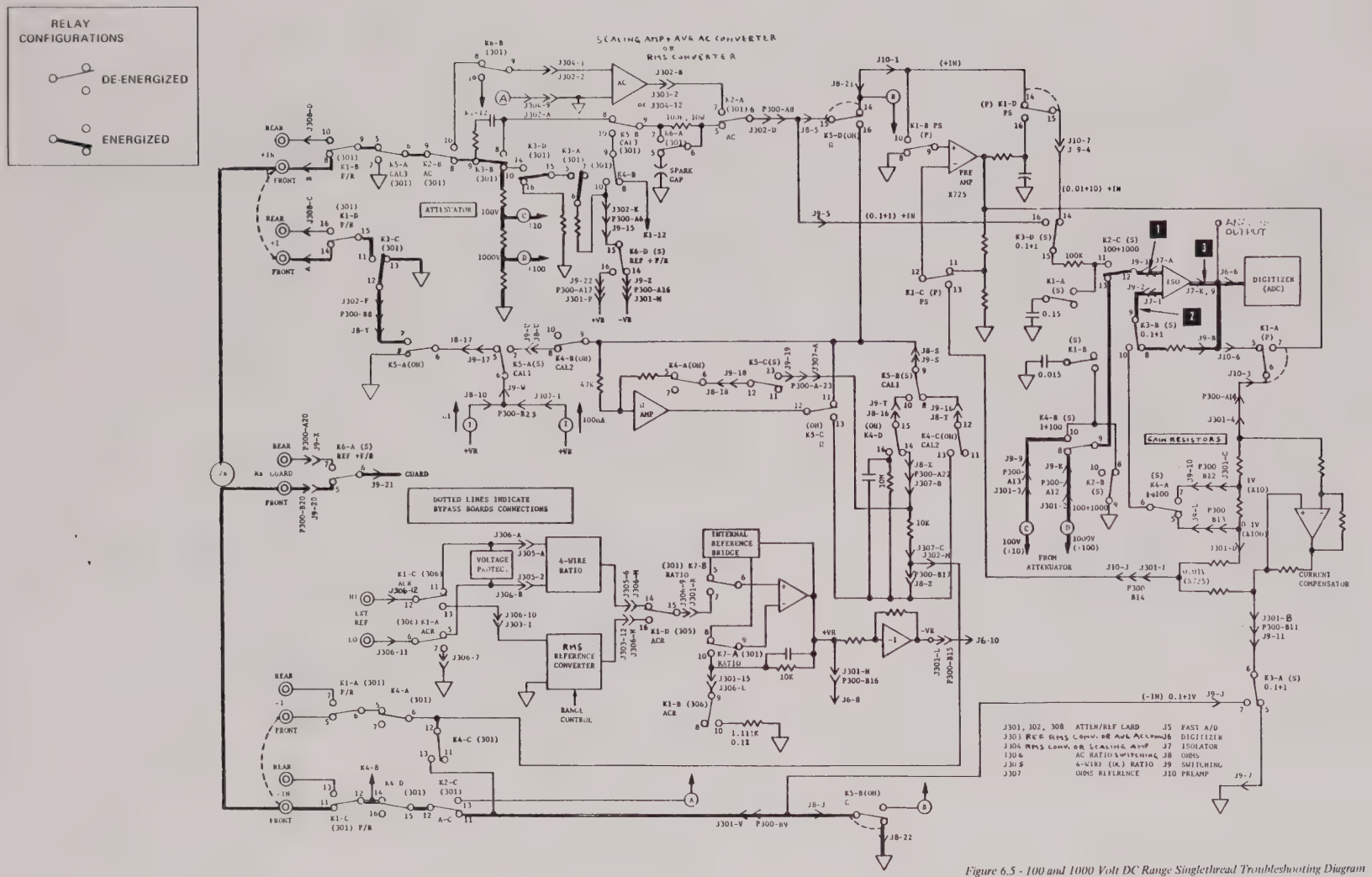


Figure 6.5 - 100 and 1000 Volt DC Range Singlethread Troubleshooting Diagram

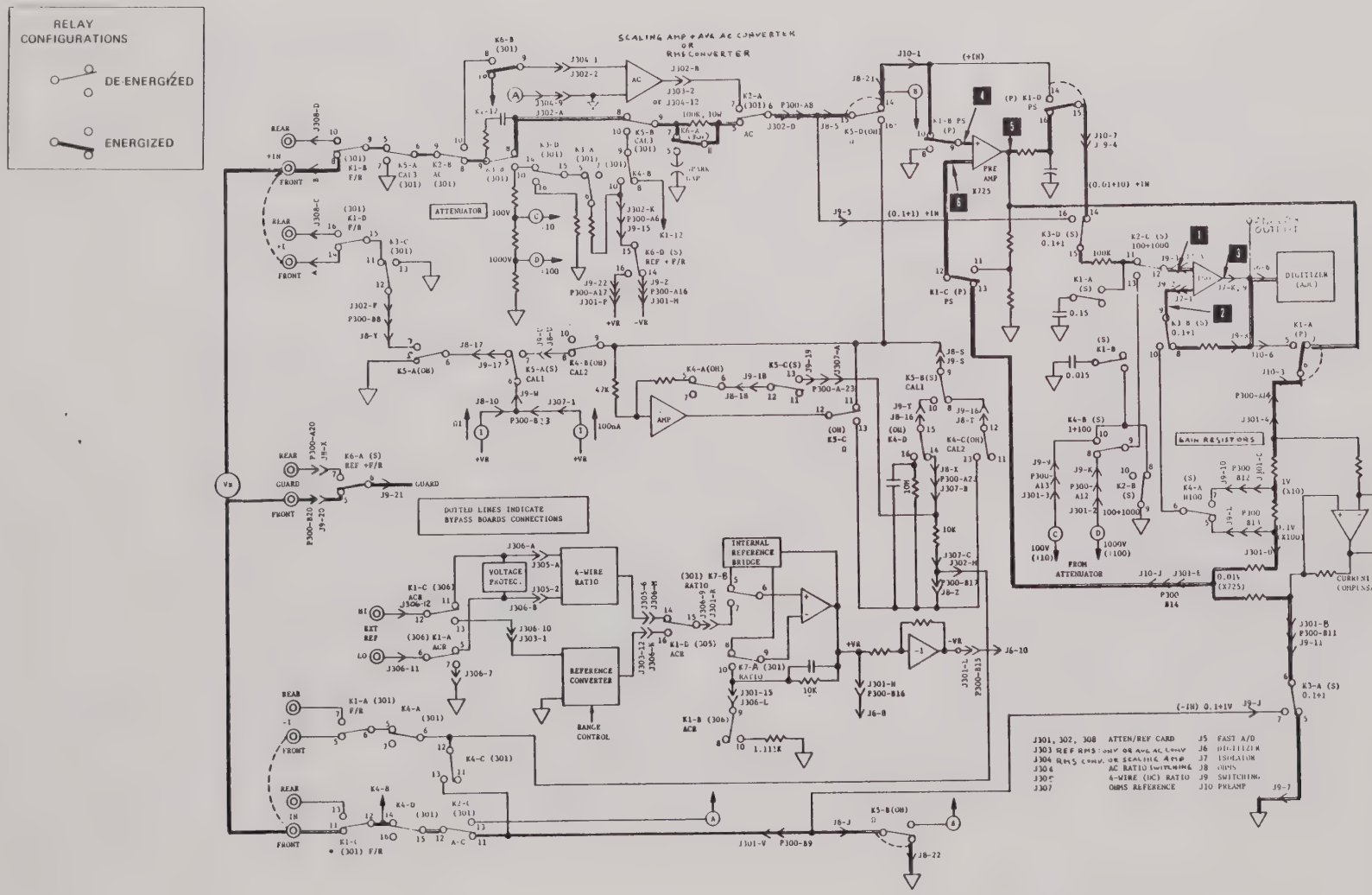


Figure 6.6 - 10mV DC Range Singlethread Troubleshooting Diagram

Table 6.10 - Ohms Range Unit Performance Tests

Input and Control Setting	Signal Nomenclature	Reference Designation	Test Point	Illustration Reference	Performance Standard
Function: Ohms Range: 10KΩ Connect 10KΩ Resistor in 4-Wire Hook-Up	All measurements are referenced to Analog Common (Mecca).				
	Ohms Amplifier output	TP4	1	Figure 6.7	–10.0 VDC
	Ohms Amplifier input	TP5	2	Figure 6.7	0.0 VDC (nominal)
	Isolator – input	TP1	3	Figure 6.7	–10.0 VDC
	Isolator output	TP2	4	Figure 6.7	–10.0 VDC
	Isolator + input	J7-A	5	Figure 6.7	–10.0 VDC
Function: Ohms Range: 100KΩ Connect 100KΩ Resistor in 4-Wire Hook-Up	Ohms Amplifier output	TP4	1	Figure 6.7	–10.0 VDC
	Ohms Amplifier input	TP5	2	Figure 6.7	0.0 VDC (nominal)
	Isolator - input	TP1	3	Figure 6.7	–10.0 VDC
	Isolator output	TP2	4	Figure 6.7	–10.0 VDC
	Isolator + input	J7-A	5	Figure 6.7	–10.0 VDC
Function: Ohms Range: 1MΩ Connect 1MΩ Resistor in 4-Wire Hook-Up	Ohms Amplifier output	TP4	1	Figure 6.7	–10.0 VDC
	Ohms Amplifier input	TP5	2	Figure 6.7	0.0 VDC (nominal)
	Isolator – input	TP1	3	Figure 6.7	–10.0 VDC
	Isolator output	TP2	4	Figure 6.7	–10.0 VDC
	Isolator + input	J7-A	5	Figure 6.7	–10.0 VDC

Table 6.10 - Ohms Range Unit Performance Tests (Continued)

Input and Control Setting	Signal Nomenclature	Reference Designation	Test Point	Illustration Reference	Performance Standard
Function: Ohms Range: 10MΩ Connect 10MΩ Resistor in 4-Wire Hook-Up	Ohms Amplifier output	TP4	1	Figure 6.7	−10.0 VDC
	Ohms Amplifier input	TP5	2	Figure 6.7	0.0 VDC (nominal)
	Isolator − input	TP1	3	Figure 6.7	−10.0 VDC
	Isolator output	TP2	4	Figure 6.7	−10.0 VDC
	Isolator + input	J7-A	5	Figure 6.7	−10.0 VDC
Function: Ohms Range: 100MΩ Connect 100MΩ Resistor in 4-Wire Hook-Up	Ohms Amplifier output	TP4	1	Figure 6.7	−10.0 VDC
	Ohms Amplifier input	TP5	2	Figure 6.7	0.0 VDC (nominal)
	Isolator − input	TP1	3	Figure 6.7	−10.0 VDC
	Isolator output	TP2	4	Figure 6.7	−10.0 VDC
	Isolator + input	J7-A	5	Figure 6.7	−10.0 VDC
Function: Ohms Range: 100Ω Connect 100Ω Resistor in 4-Wire Hook-Up	Ohms Amplifier output	TP4	1	Figure 6.8	−1.0 VDC
	Ohms Amplifier input	TP5	2	Figure 6.8	0.0 VDC (nominal)
	Isolator − input	TP1	3	Figure 6.8	0.0 VDC (nominal)
	Isolator output	TP2	4	Figure 6.8	+9.0 VDC
	Isolator + input	J7-A	5	Figure 6.8	0.0 VDC (nominal)

Table 6.10 - Ohms Range Unit Performance Tests (Continued)

Input and Control Setting	Signal Nomenclature	Reference Designation	Test Point	Illustration Reference	Performance Standard
Function: Ohms Range: 1KΩ Connect 1KΩ Resistor in 4-Wire Hook-Up	Ohms Amplifier output	TP4	1	Figure 6.8	–1.0 VDC
	Ohms Amplifier input	TP5	2	Figure 6.8	0.0 VDC (nominal)
	Isolator – input	TP1	3	Figure 6.8	0.0 VDC (nominal)
	Isolator + output	TP2	4	Figure 6.8	+9.0 VDC
	Isolator input	J7-A	5	Figure 6.8	0.0 VDC (nominal)
Function: Ohms Range: 10Ω Connect 10Ω Resistor in 4-Wire Hook-Up	Ohms Amplifier output	TP4	1	Figure 6.9	–0.1 VDC
	Ohms Amplifier input	TP5	2	Figure 6.9	0.0 VDC (nominal)
	Isolator – input	TP1	3	Figure 6.9	0.00 VDC (nominal)
	Isolator output	TP2	4	Figure 6.9	+9.9 VDC
	Isolator + input	J7-A	5	Figure 6.9	0.0 VDC (nominal)
Function: Ohms Range: 1Ω Connect 1Ω Resistor in 4-Wire Hook-Up	Ohms Amplifier output	TP4	1	Figure 6.10	–10.0 mVDC
	Ohms Amplifier input	TP5	2	Figure 6.10	0.0 VDC
	Isolator – input	TP1	3	Figure 6.10	–7.2 VDC
	Isolator output	TP2	4	Figure 6.10	–7.2 VDC
	Isolator + input	J7-A	5	Figure 6.10	–7.2 VDC

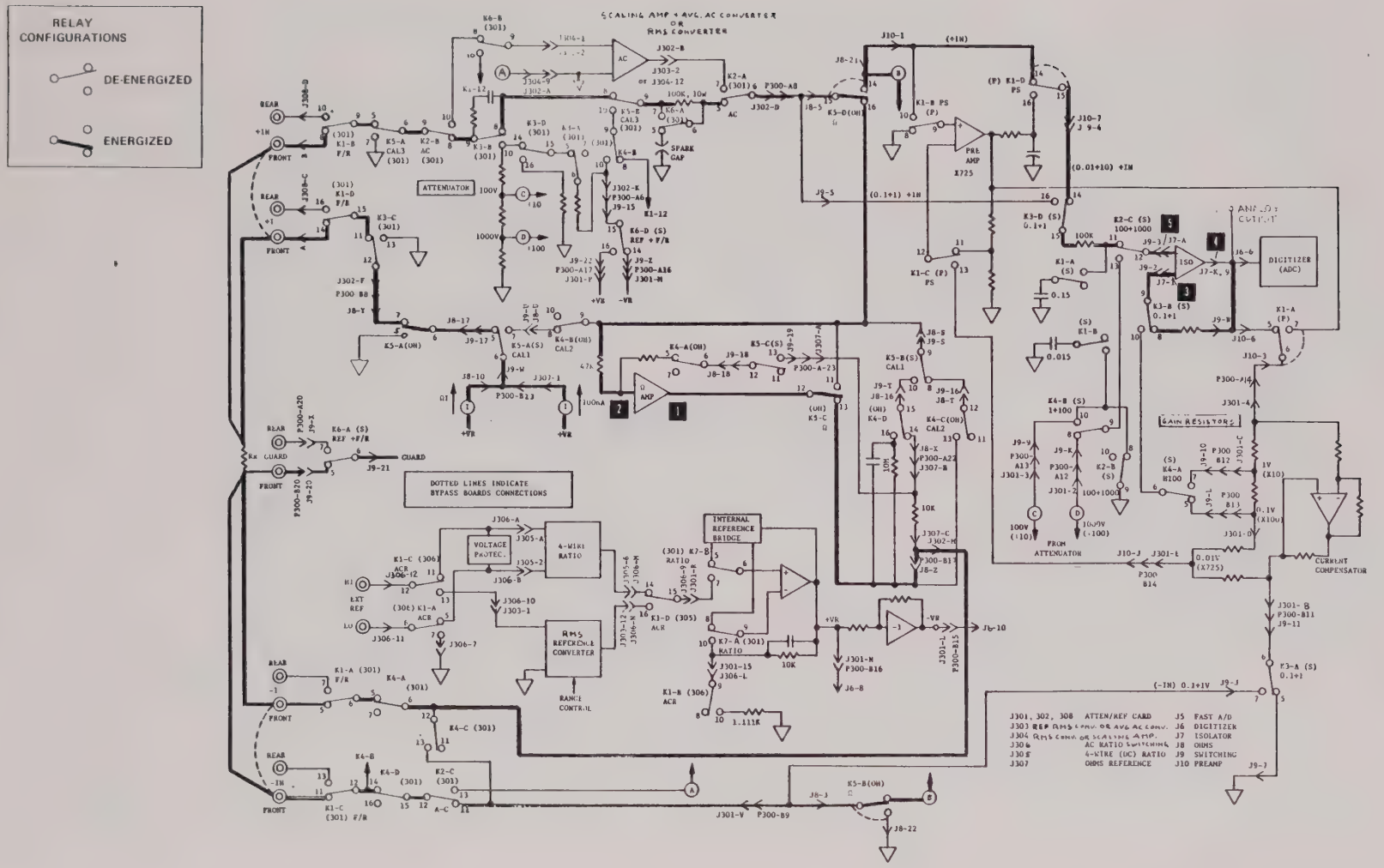


Figure 6.7 - 10K, 100K, 1M, 10M, 100M Ranges Singlethread Troubleshooting Diagram

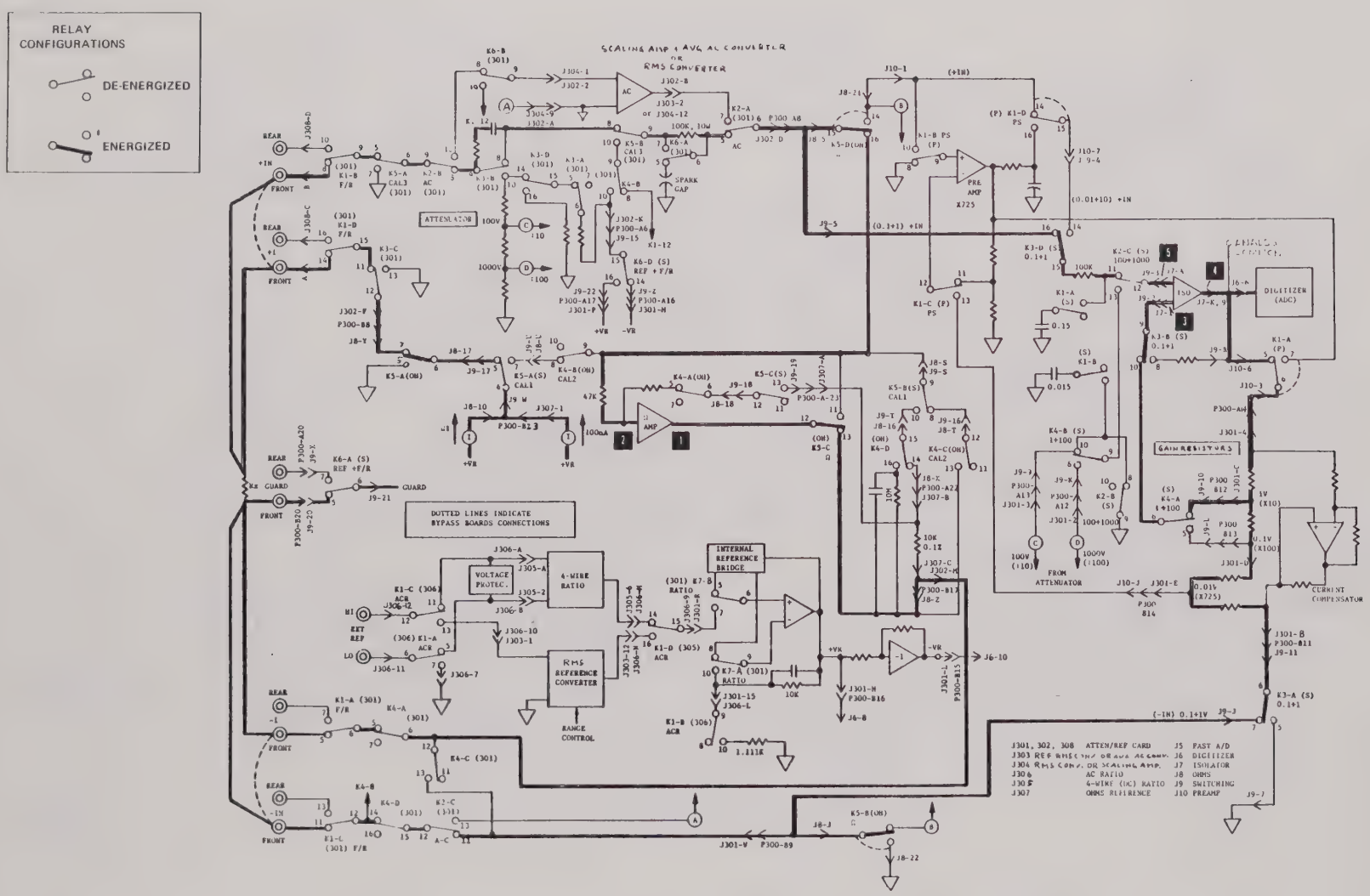


Figure 6.8 - 100, 1K Ohm Ranges Singlethread Troubleshooting Diagram

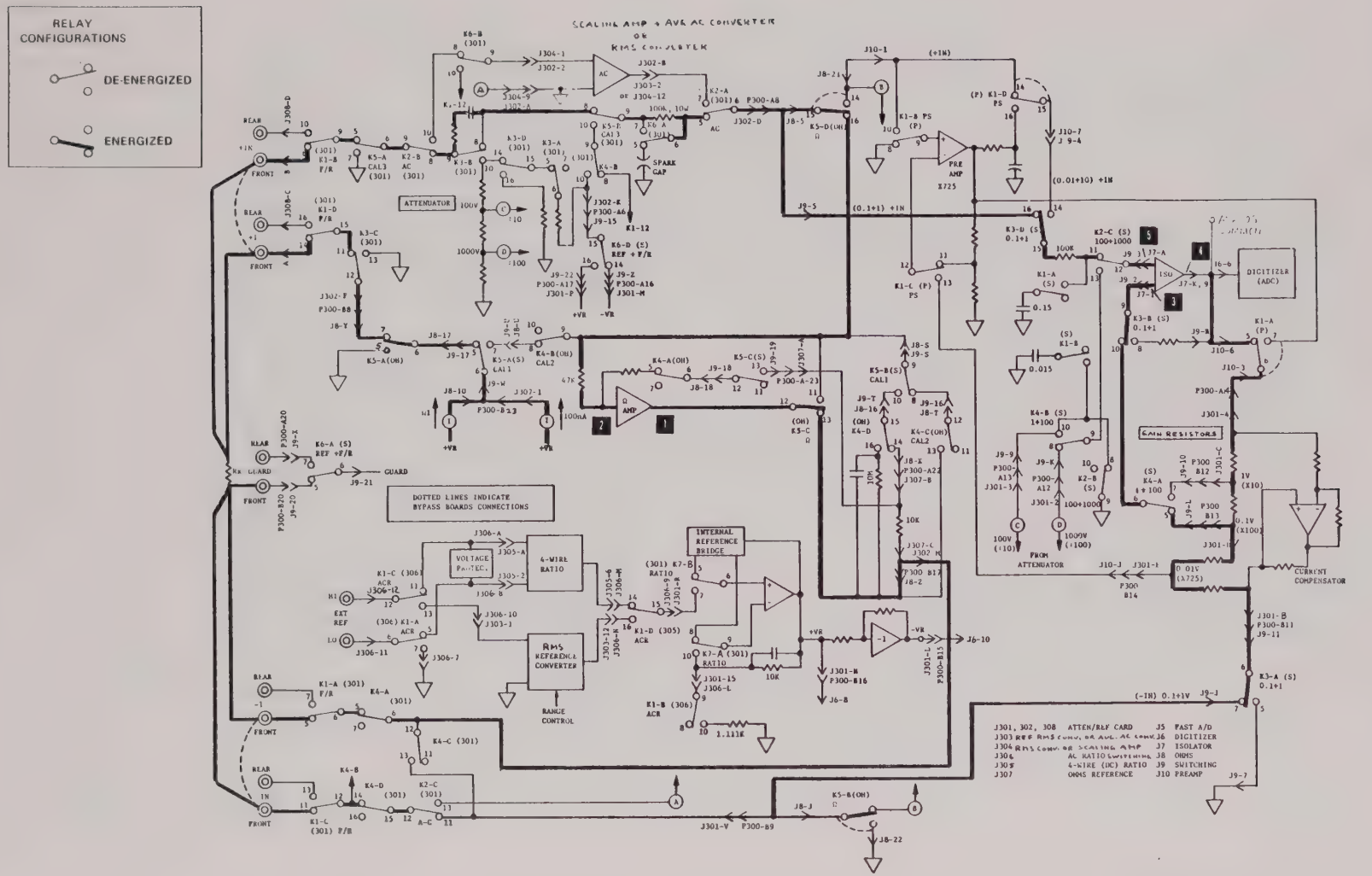


Figure 6.9 - 10 Ohm Range Singlethread Troubleshooting Diagram

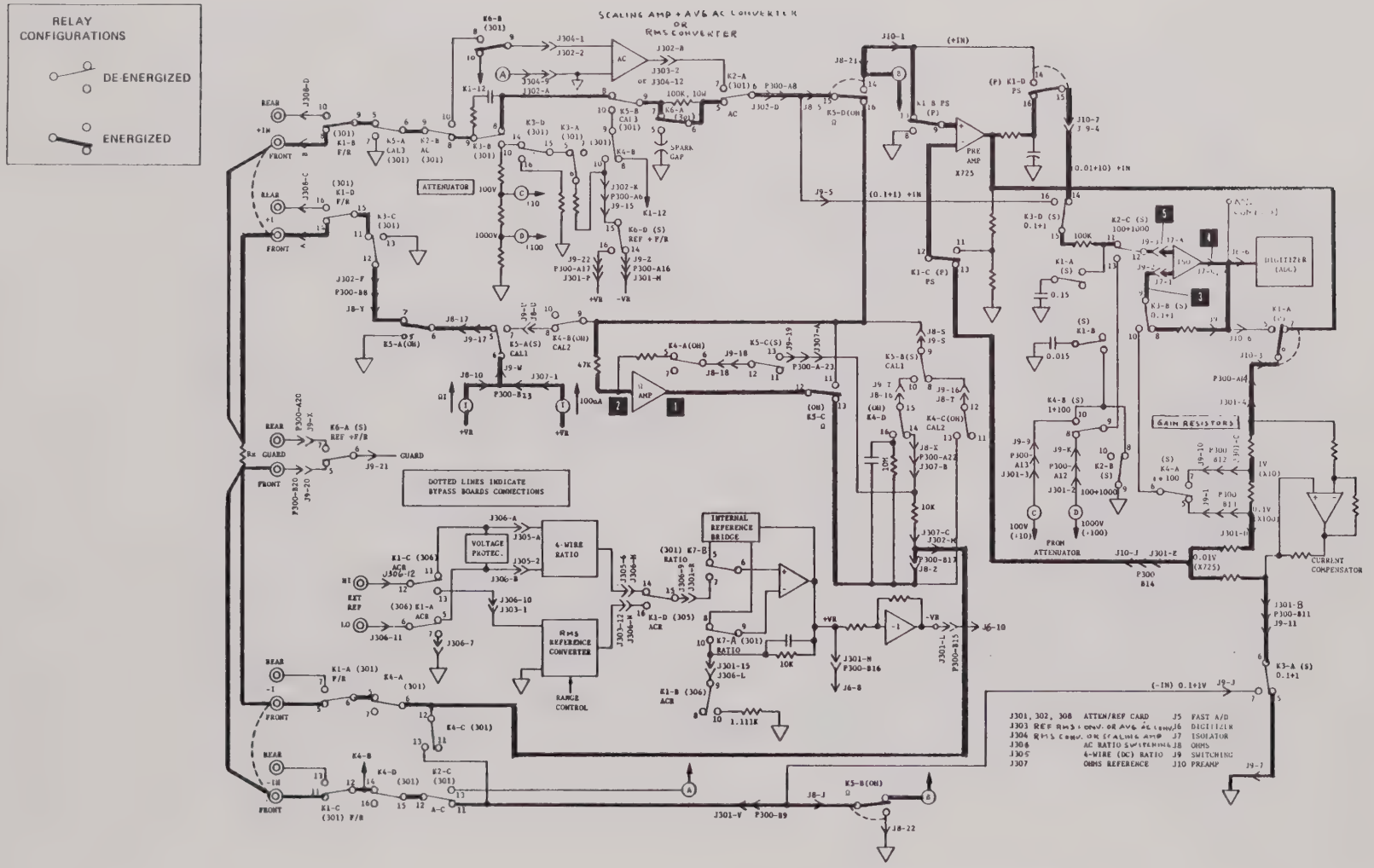


Figure 6.10 - 1 Ohm Range Singlethread Troubleshooting Diagram

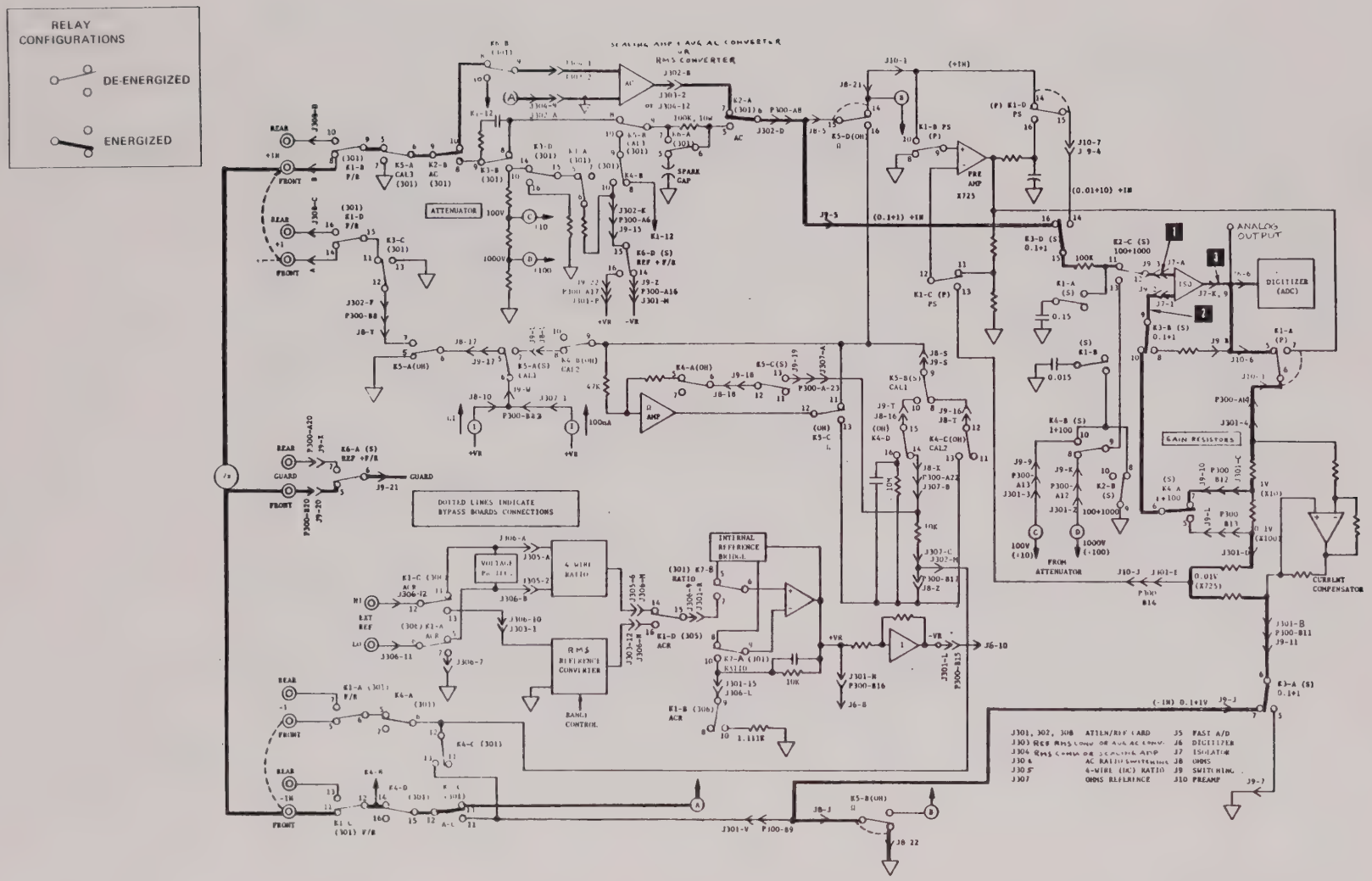


Figure 6.11 - AC Volts Singlethread Troubleshooting Diagram

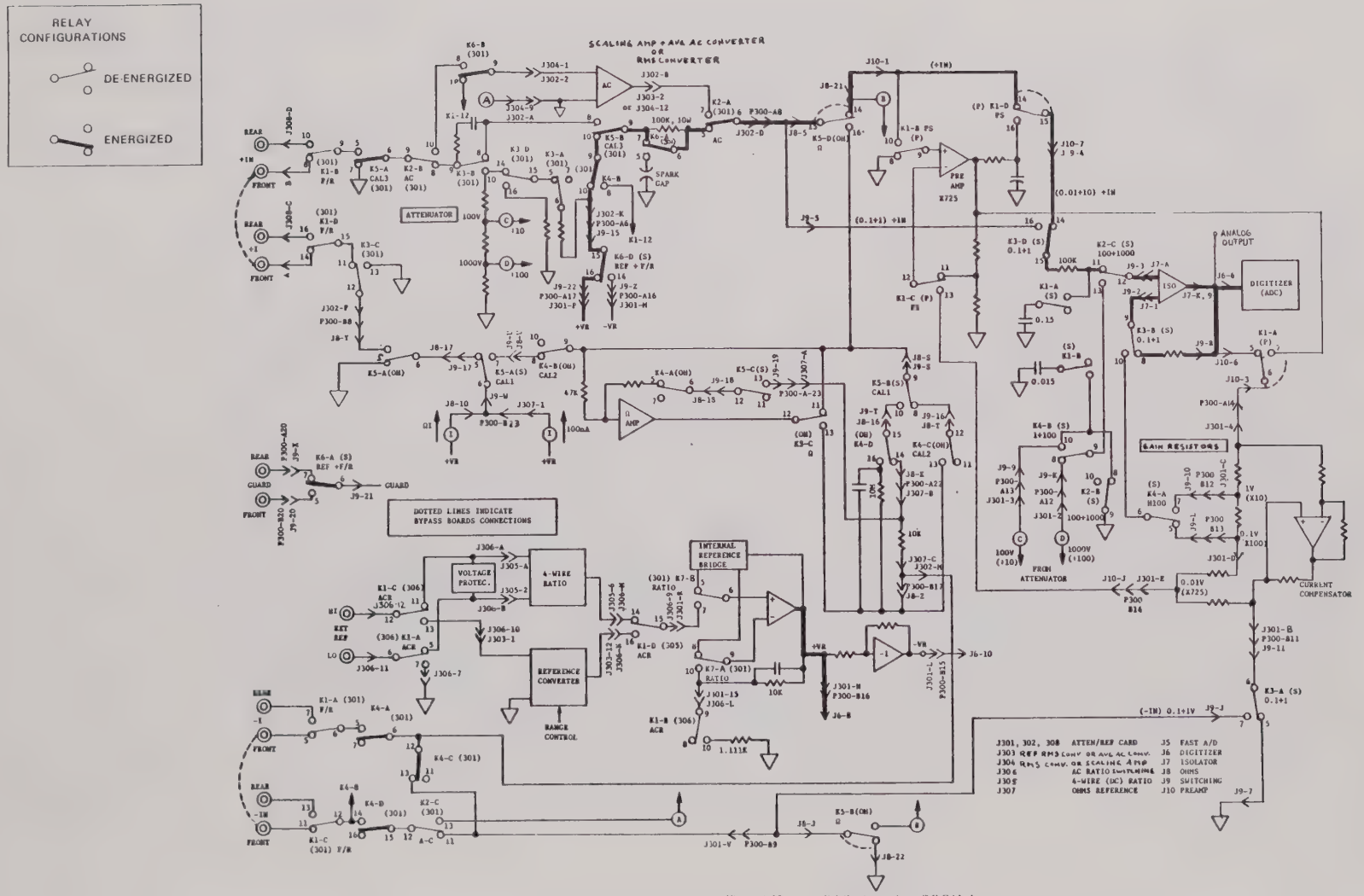


Figure 6.12 - Auto-Cal Configuration - DC CAL 1

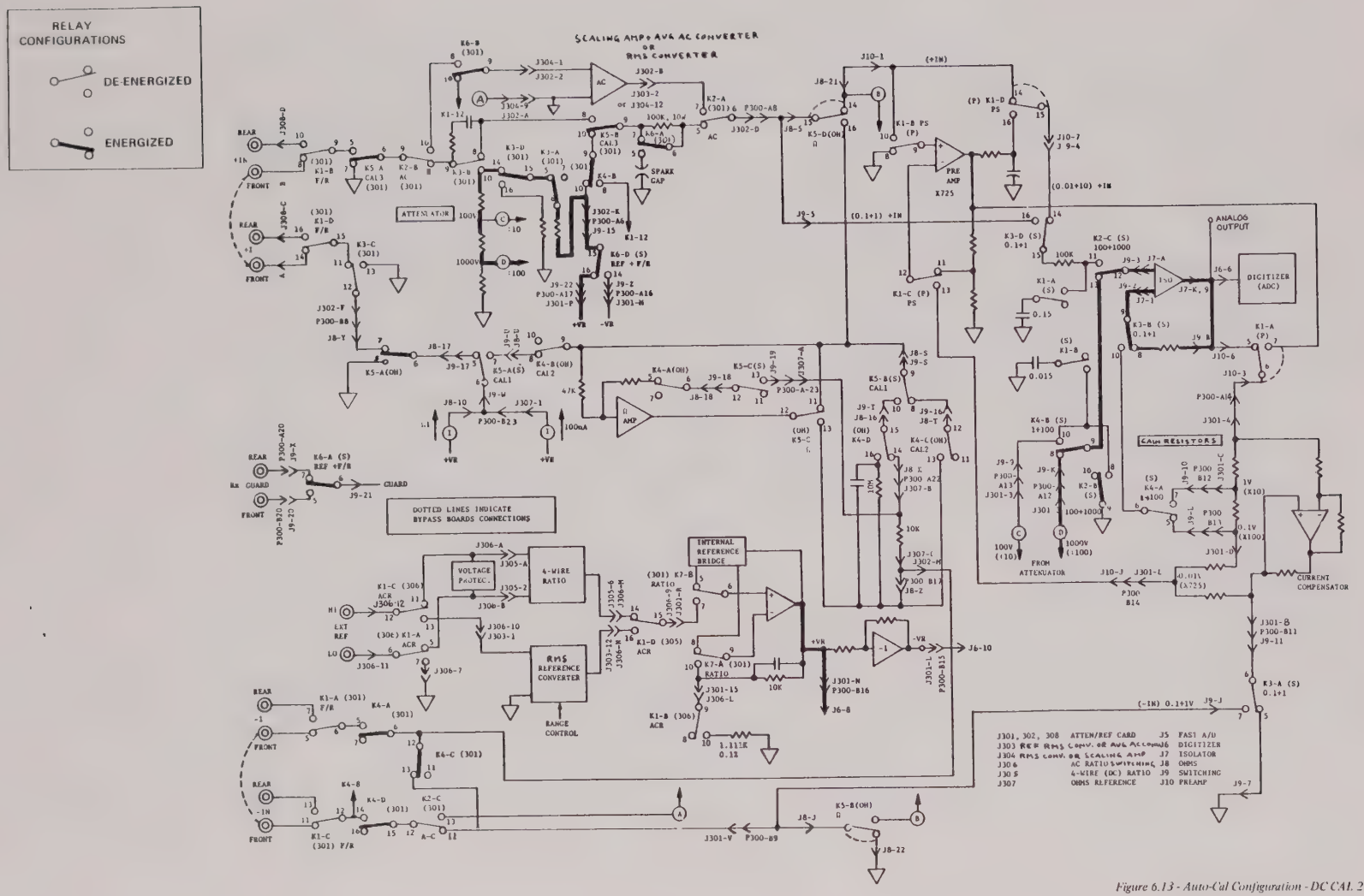


Figure 6.13 - Auto-Cal Configuration - DC CAL 2

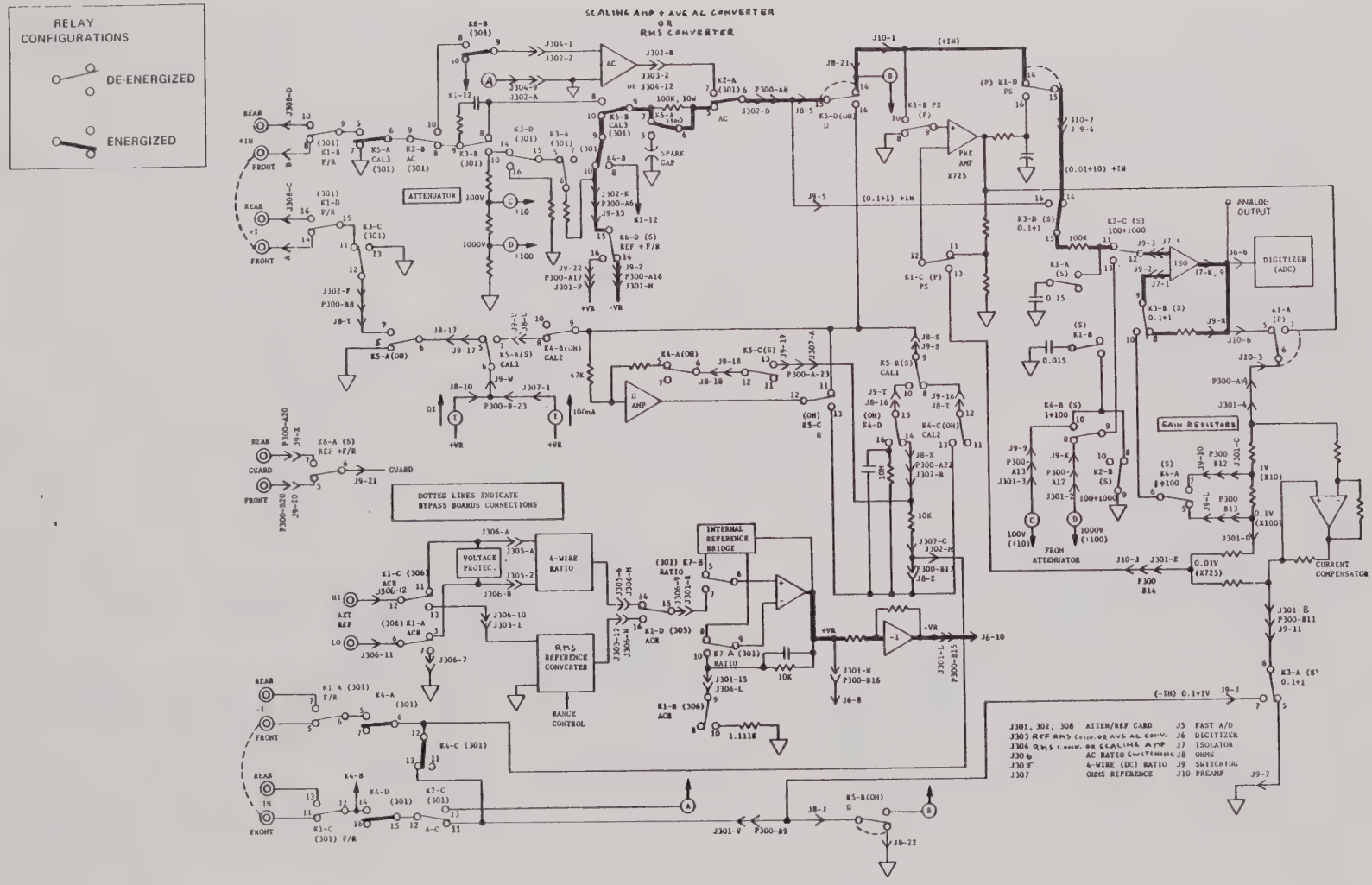


Figure 6.14 - Auto-Cal Configuration - DC CAL 3

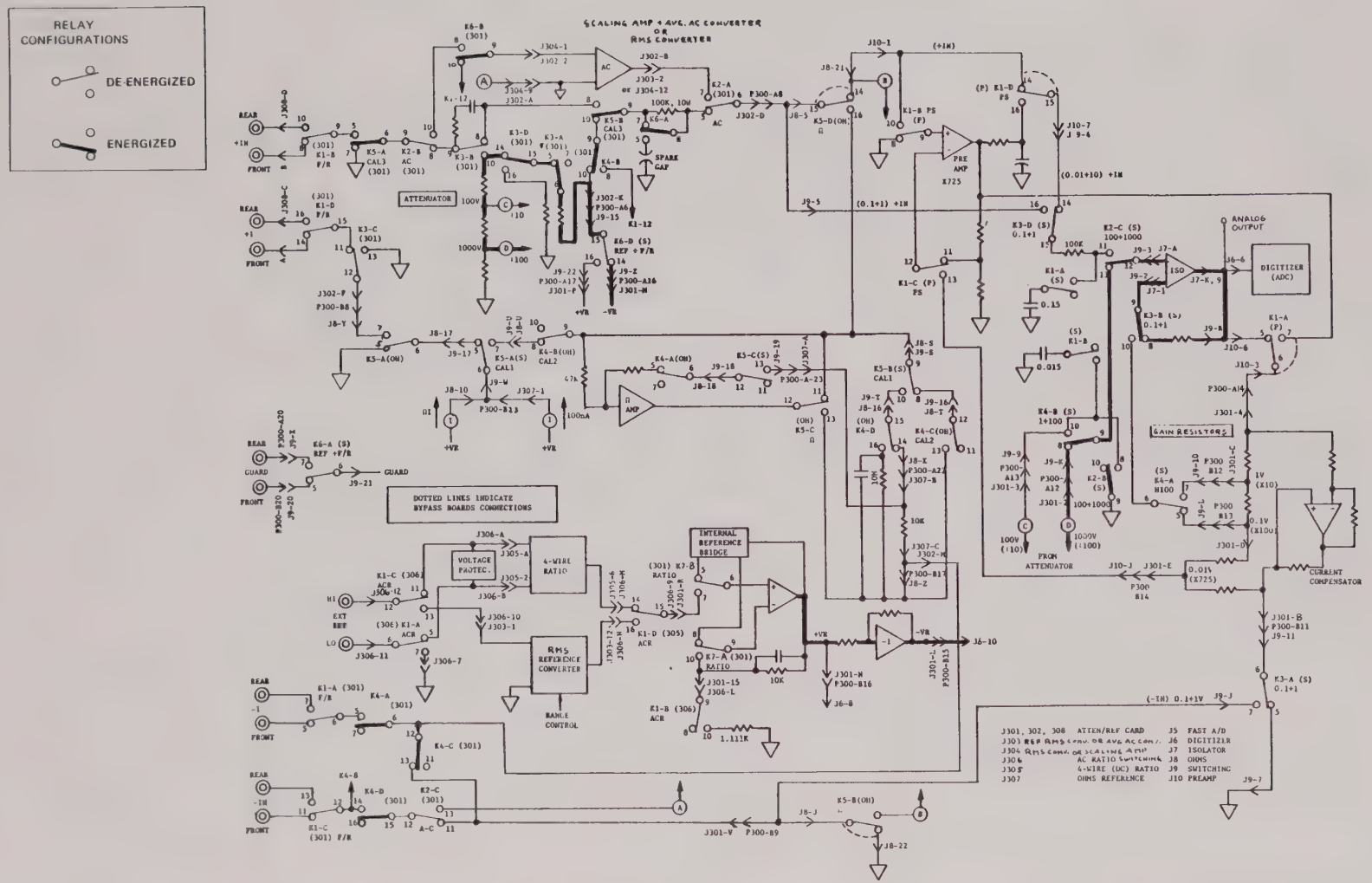


Figure 6.15 - Auto-Cal Configuration - DC CAL 4

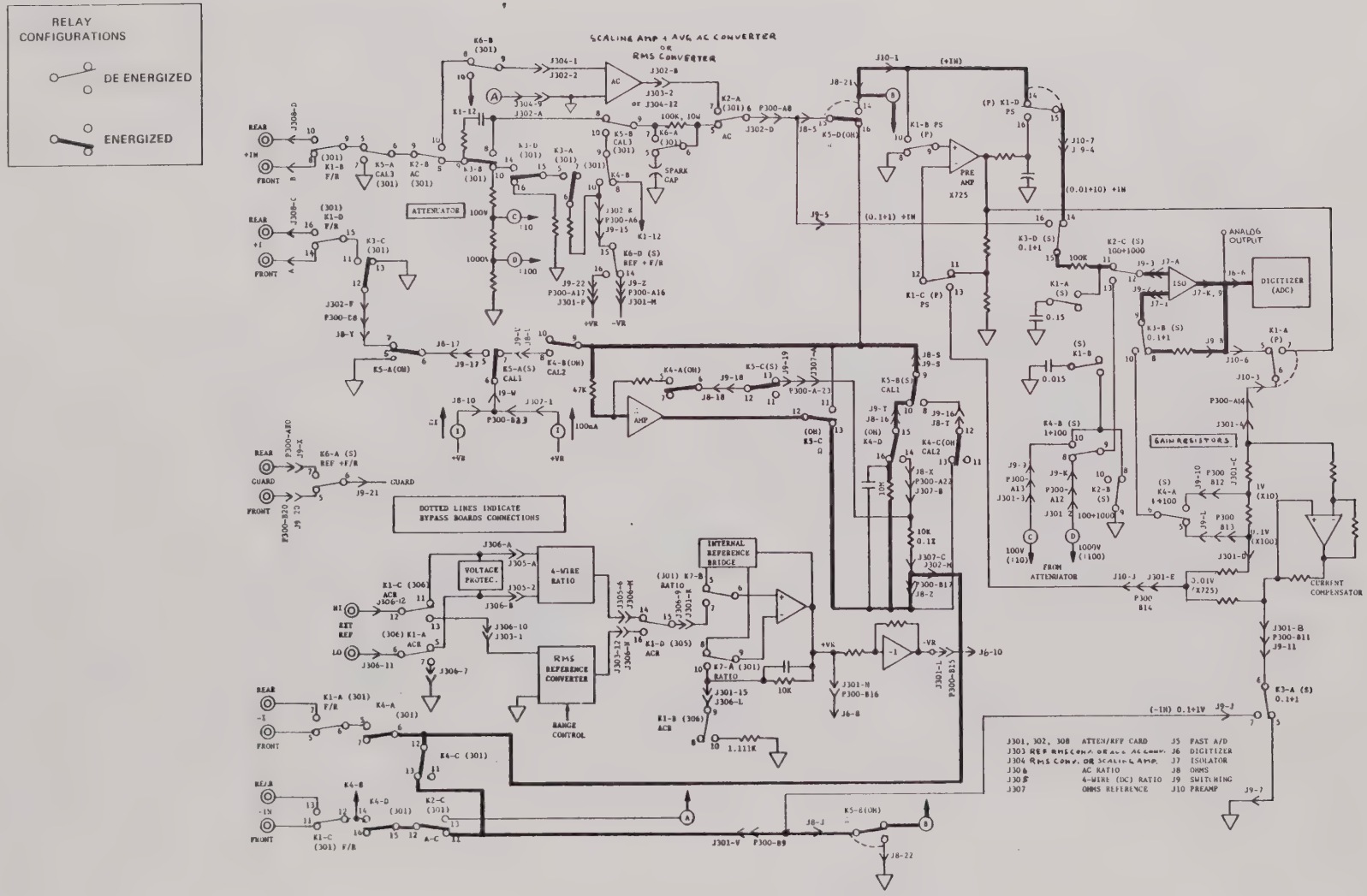


Figure 6.16 - Auto-Cal Configuration - OHMS CAL 4

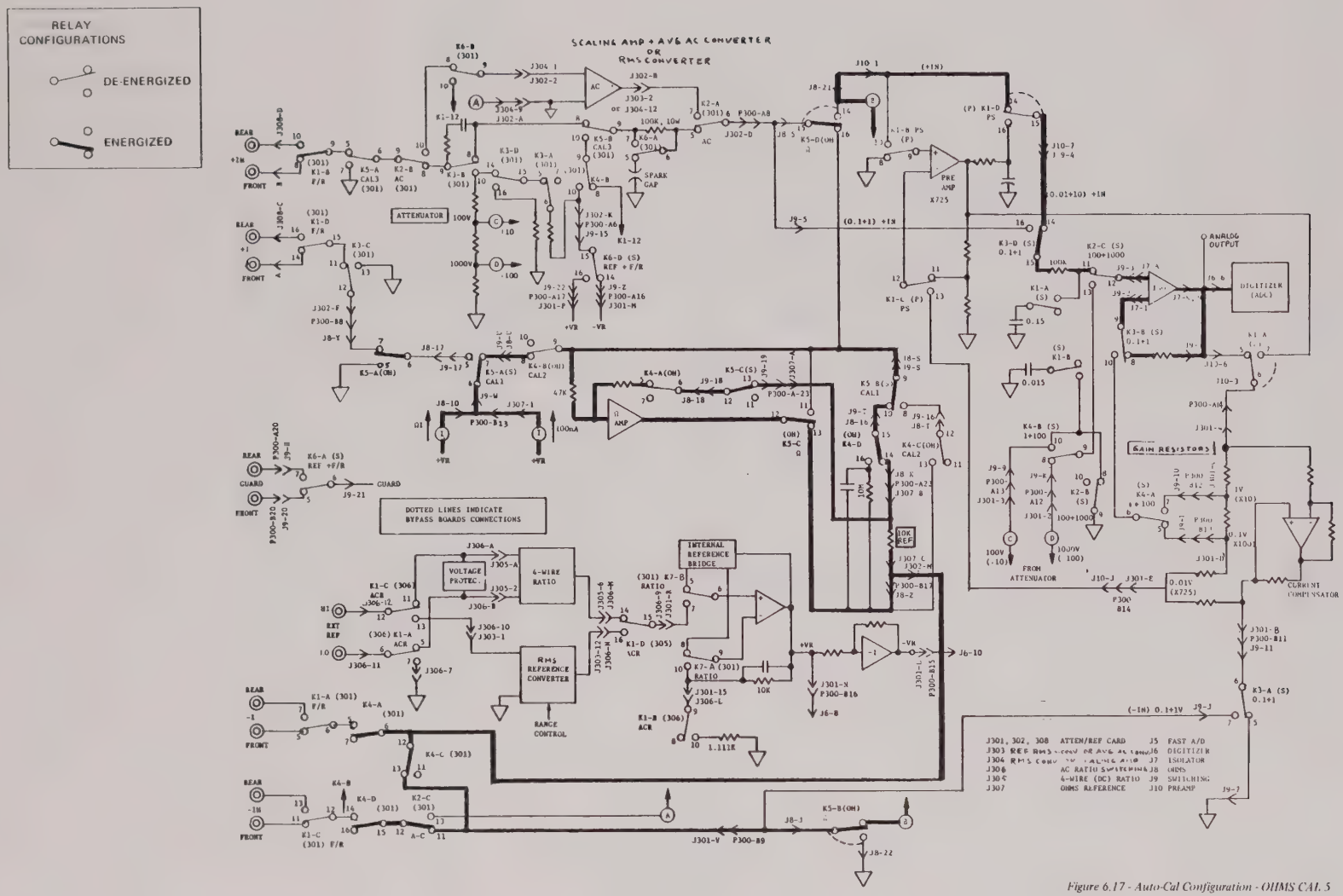


Figure 6.17 - Auto-Cal Configuration - OHMS CAL 5

Table 6.11 - **Display/Keyboard Subassembly Performance Test**

Input and Control Setting	Signal Nomenclature	Reference Designation	Test Point	Illustration Reference	Performance Standard
Function: DC Range: Auto		CR17	1	Figure 6.18	DC annunciator lit
Function: AC Range: Auto		CR18	2	Figure 6.18	AC annunciator lit
Function: Ohms Range: 10-100		CR19	3	Figure 6.18	Ohms annunciator lit
Function: Ohms Range: 1K-100K Input Terminals: +IN/+I terminals connected with a copper jumper to –IN/–I		LED1 through LED9	4	Figure 6.18	Display LED should indicate 0 ohms

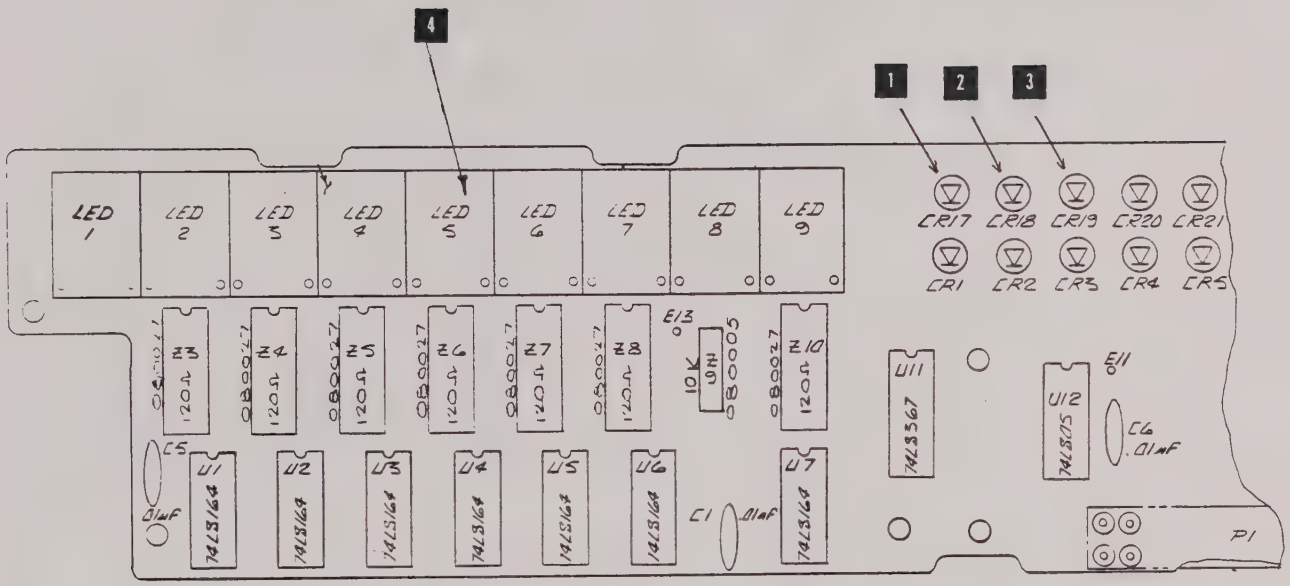


Figure 6.18 - Display/Keyboard Component Location Diagram

Table 6.12 - GPIB IEEE Subassembly Performance Test

Input and Control Setting	Signal Nomenclature	Reference Designation	Test Point	Illustration Reference	Performance Standard
REQUIREMENT The Controller makes device a listener	This performance test assumes that the DMM is operating with an HP 9825 calculator/controller Program: wrt 700" "; CLI7. All waveform measurements (except 2 and 3) are synced to ATN negative edge.				
	ATN	U25-12	1	Figure 6.19	TTL High Level
	NRFD	U29-4	A	Figure 6.19	Waveform 4
	DAV	U29-3	B	Figure 6.19	Waveform 5
	NDAC	U29-2	C	Figure 6.19	Waveform 6
	LIS Flip-Flop	U7-9	D	Figure 6.19	Waveform 1
	Address Compare	U18-8	E	Figure 6.19	Waveform 2
	Qualifier Inverter	U25-8	F	Figure 6.19	Waveform 3

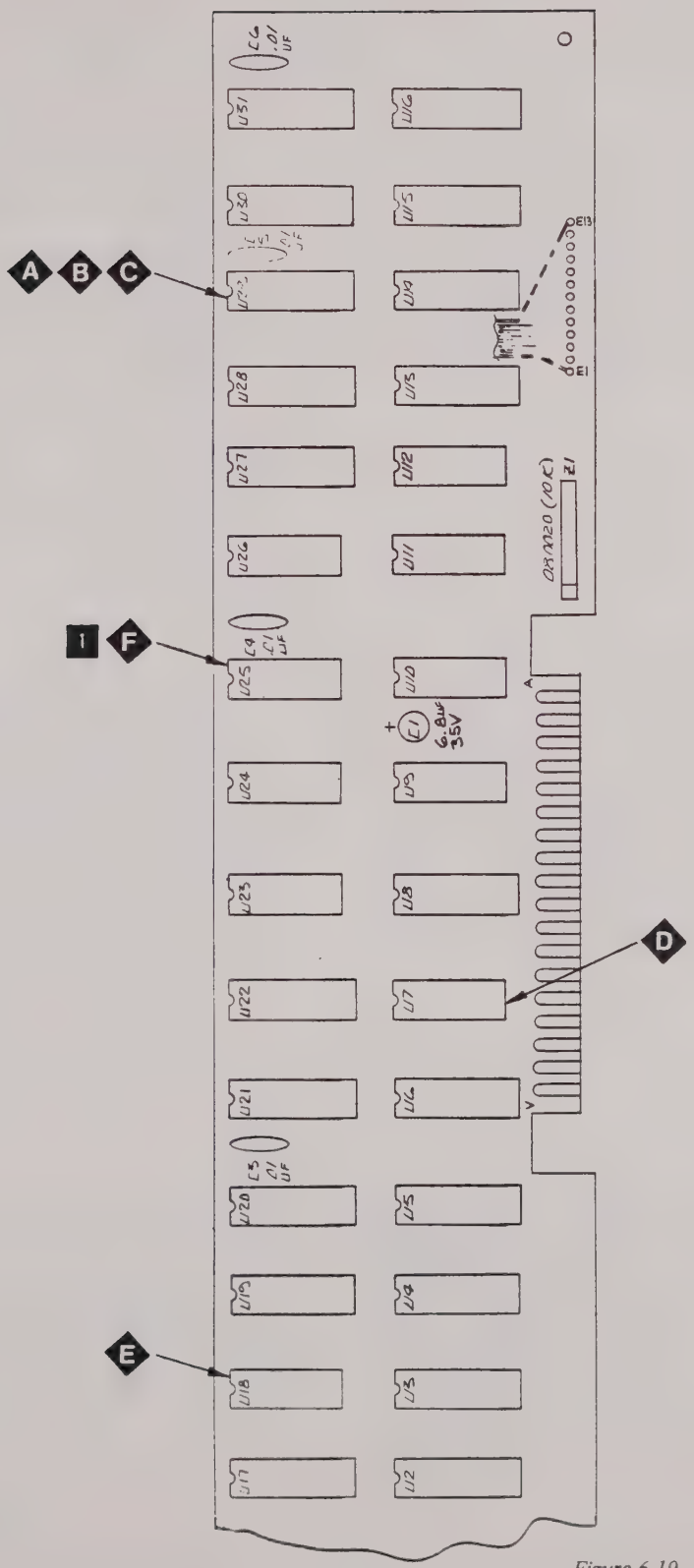
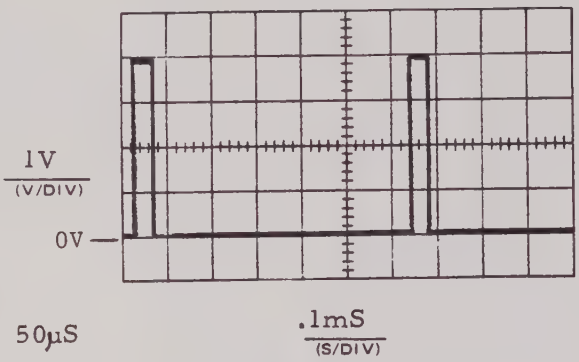


Figure 6.19 - GPIB Component Location Diagram

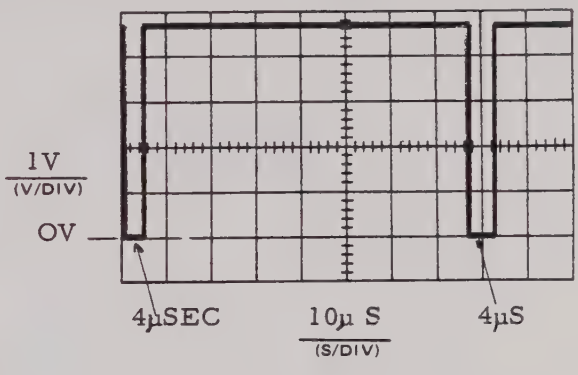
WAVEFORMS FOR TABLE 6.12

1 (NO.)



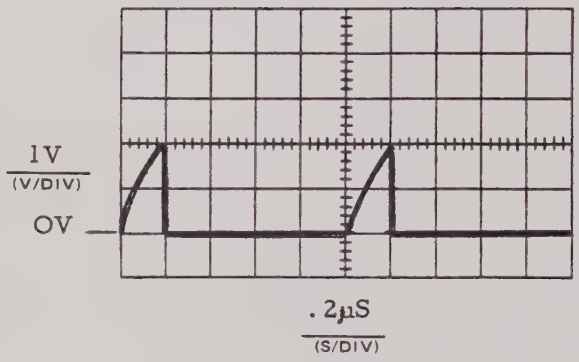
2 (NO.)

NO SYNC

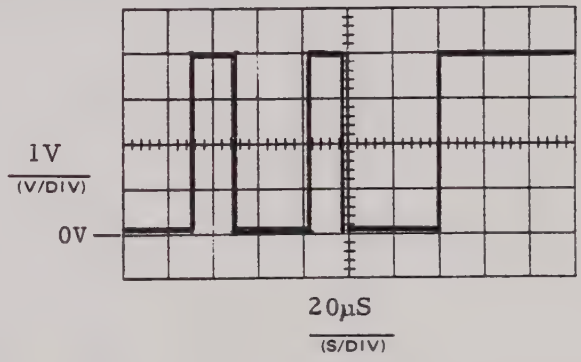


3 (NO.)

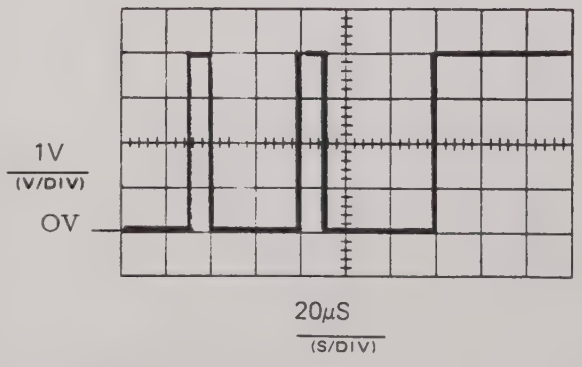
NO SYNC



4 (NO.)



5 (NO.)



6 (NO.)

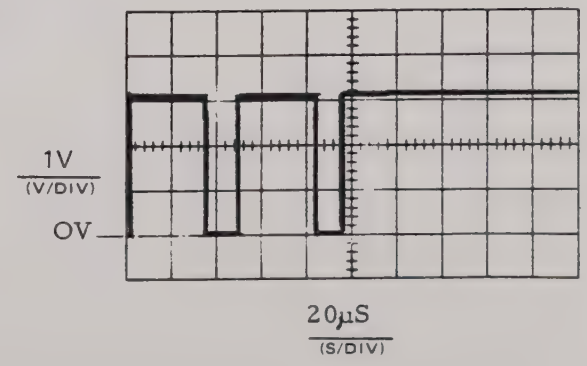


Table 6.13 - Computer 1 Subassembly Performance Test

Input and Control Setting	Signal Nomenclature	Reference Designation	Test Point	Illustration Reference	Performance Standard
Function: DC Range: Auto Input Terminals: +10V DC	Ø2	U2-8	A	Figure 6.20	Waveform 1
Cycle Power Switch	Display should read "6000"				
Press and Hold □ DC	After five seconds the "6000" on the display should be replaced by "7"				

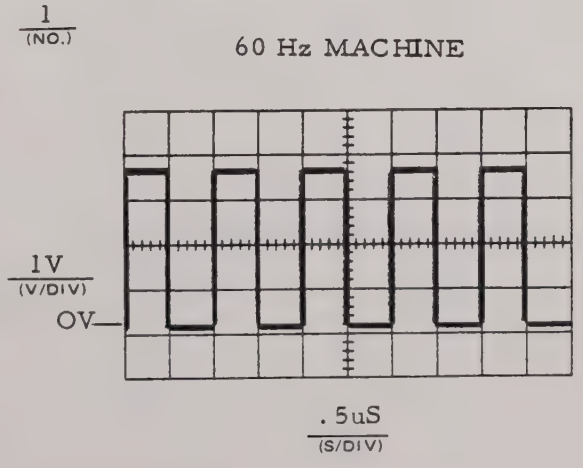
In a "make before break" fashion, press the keys in the order shown in the chart and verify that the appropriate number is displayed. Do not press the "Shift" key.

□ Key	Number Displayed
DC	7
AC	4
Ω	3
FILTER	0
DN	11
UP	8

□ Key	Number Displayed
STORE	15
RECALL	12
# DIGITS	19
C/S	16
EXP	23
CE	20

□ Key	Number Displayed
9	22
8	21
7	18
6	17
5	14
4	13

□ Key	Number Displayed
3	10
2	9
1	2
0	1
•	6



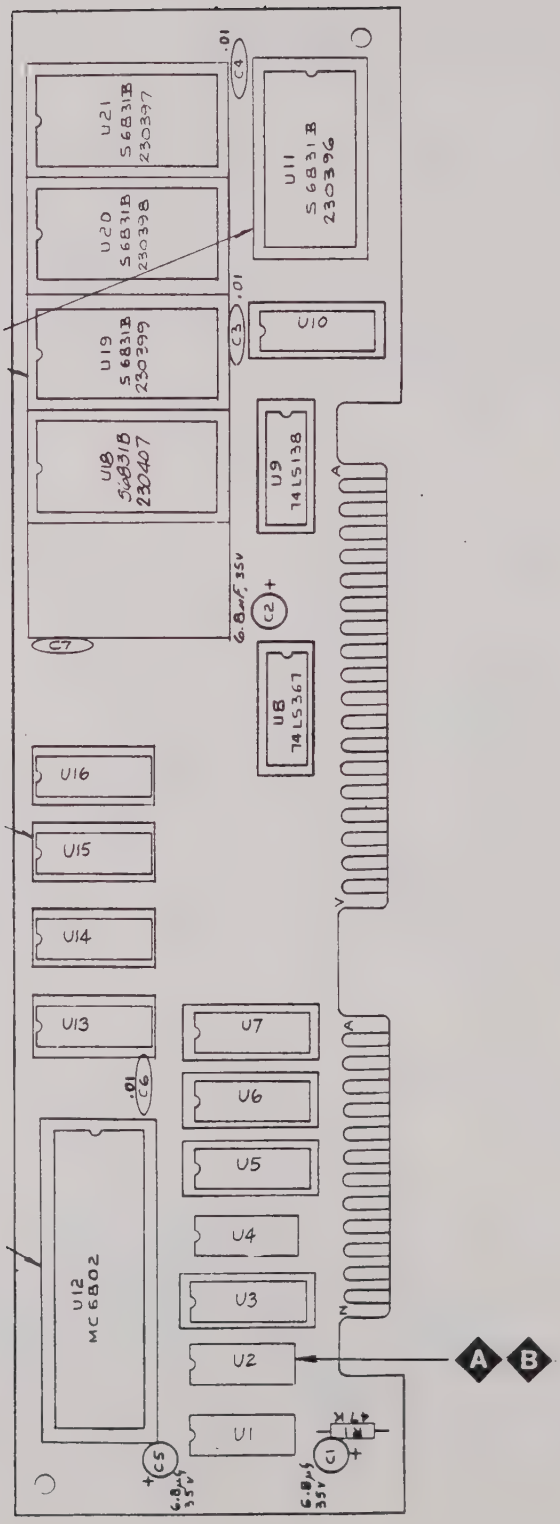


Figure 6.20 - Computer I - Component Location Diagram

Table 6.14 - Control Logic Subassembly Performance Test

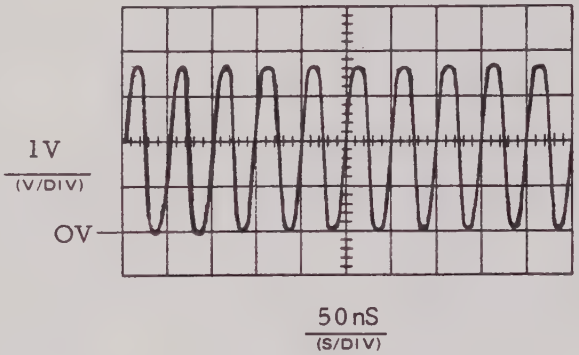
Input and Control Setting	Signal Nomenclature	Reference Designation	Test Point	Illustration Reference	Performance Standard
Function: DC Range: Auto Input Terminals: +10V DC	Waveforms 3, 5 and 6 are synced to the negative edge of the signal at U9-6.				
	Master clock output	U17-3	A	Figure 6.21	Waveform 1
	4F0 output	U21-5	B	Figure 6.21	Waveform 2
	Clock Sync output	U18-3	C	Figure 6.21	Waveform 3
	Reset timer output	U9-8	D	Figure 6.21	Waveform 4
	Signal integrate	U7-9	E	Figure 6.21	Waveform 5
	Zero Crossing enable	U19-8	F	Figure 6.21	Waveform 6

WAVEFORMS FOR TABLE 6.14

1 (NO.)

INTERNAL SYNC + EDGE

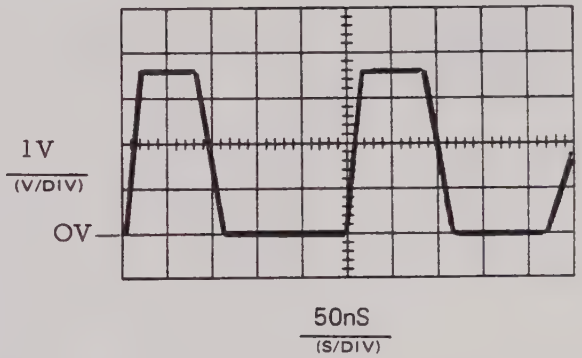
SINEWAVE 41.66 nS (60 Hz)



U17-3

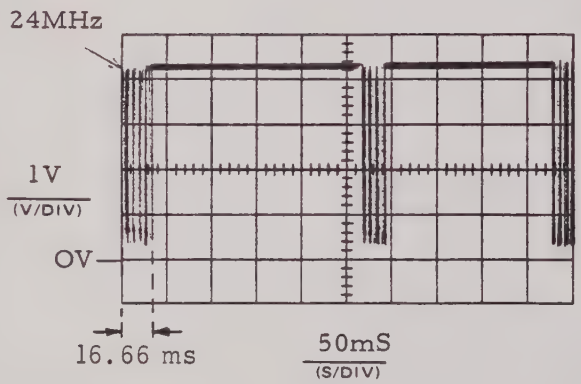
2 (NO.)

INTERNAL SYNC + EDGE



U21-5

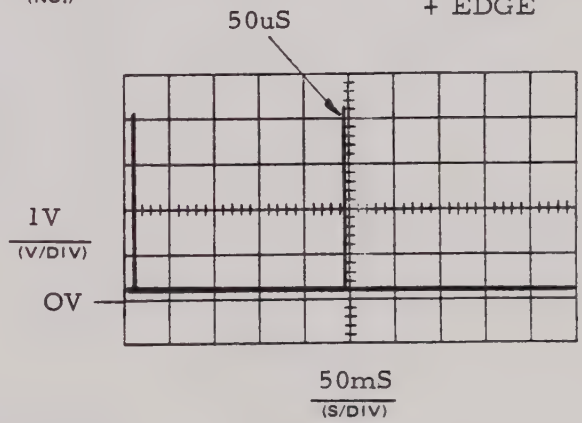
3 (NO.)



U18-3

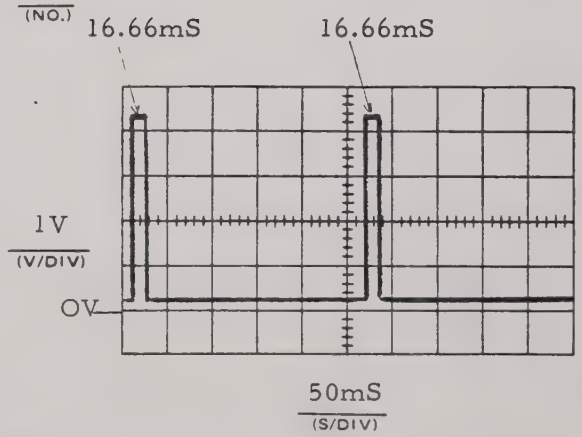
4 (NO.)

INTERNAL SYNC + EDGE



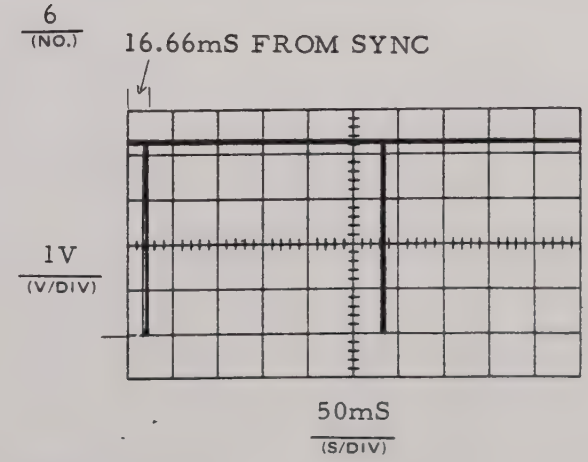
U9-8

5 (NO.)



U7-9

6 (NO.)



U19-8

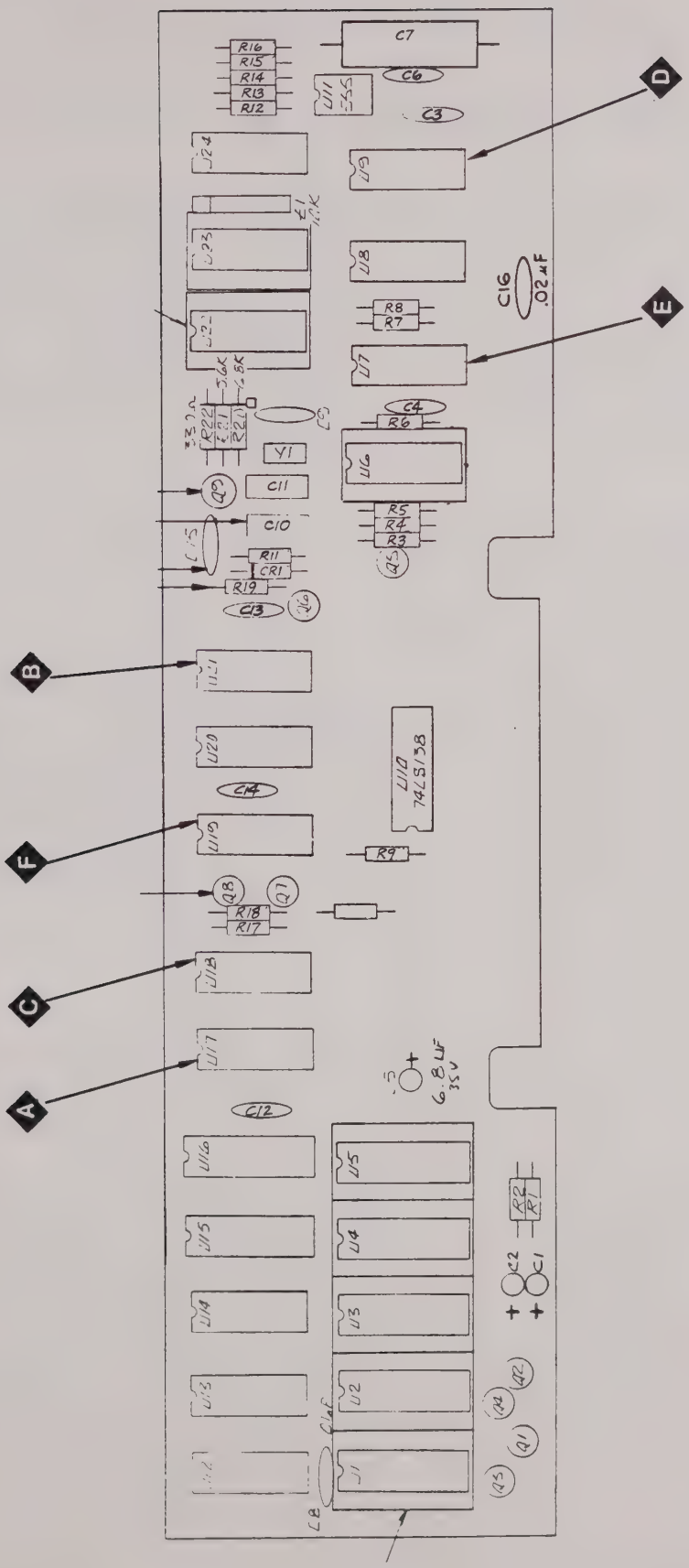


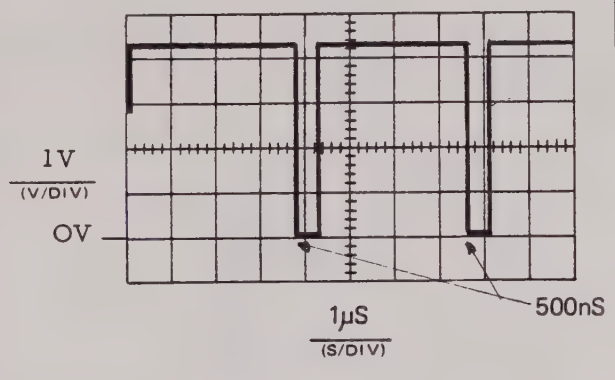
Figure 6.21 - Control Logic Component Location Diagram

Table 6.15 - Fast Waveform Digitizer Subassembly Performance Test

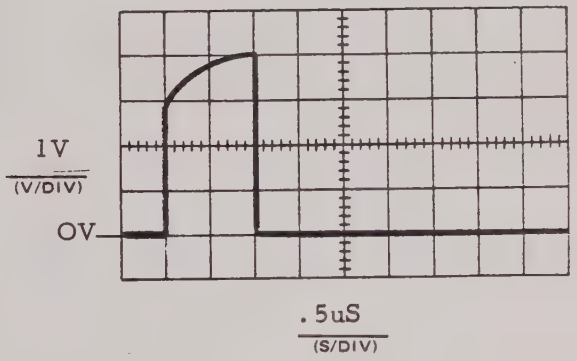
Input and Control Setting	Signal Nomenclature	Reference Designation	Test Point	Illustration Reference	Performance Standard
Function: DC Range: Auto Input Terminals: +10V DC (1777 octal on display)	All waveforms are synced to the positive edge of the MPU trigger signal (U7-5).				
	Serial/parallel output Reg. reset	U8-6	A	Figure 6.22	Waveform 1
	A/D trigger	U2-5	B	Figure 6.22	Waveform 2 Note: Ground Scope at U2-8
	Serial/parallel output Reg. clock	U8-3	C	Figure 6.22	Waveform 3
	A/D data	U15-3	D	Figure 6.22	Waveform 4
	MPU data bus output enable	J1-A	E	Figure 6.22	Waveform 5
	MPU data bus output enable	J1-1	F	Figure 6.22	Waveform 6

WAVEFORMS FOR TABLE 6.15

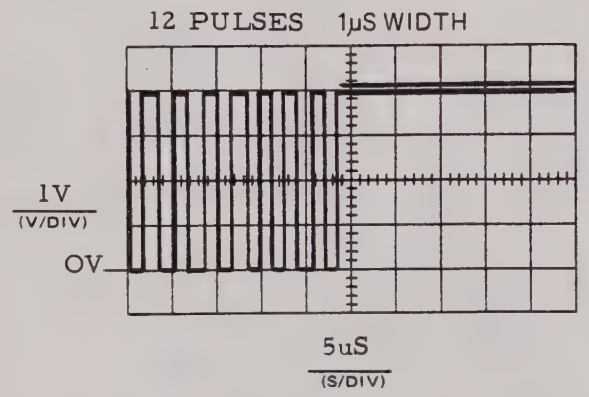
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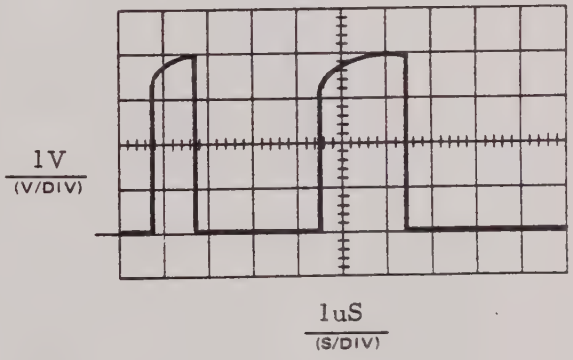
2 (NO.)



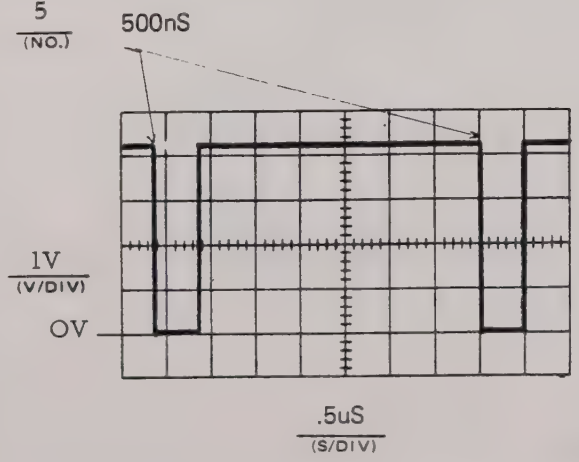
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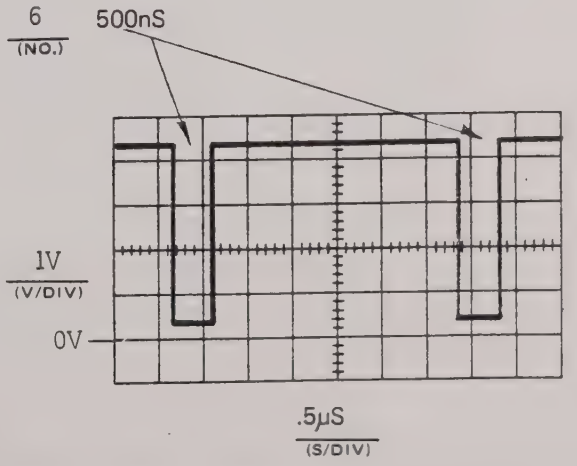
4 (NO.)



5 (NO.)



6 (NO.)



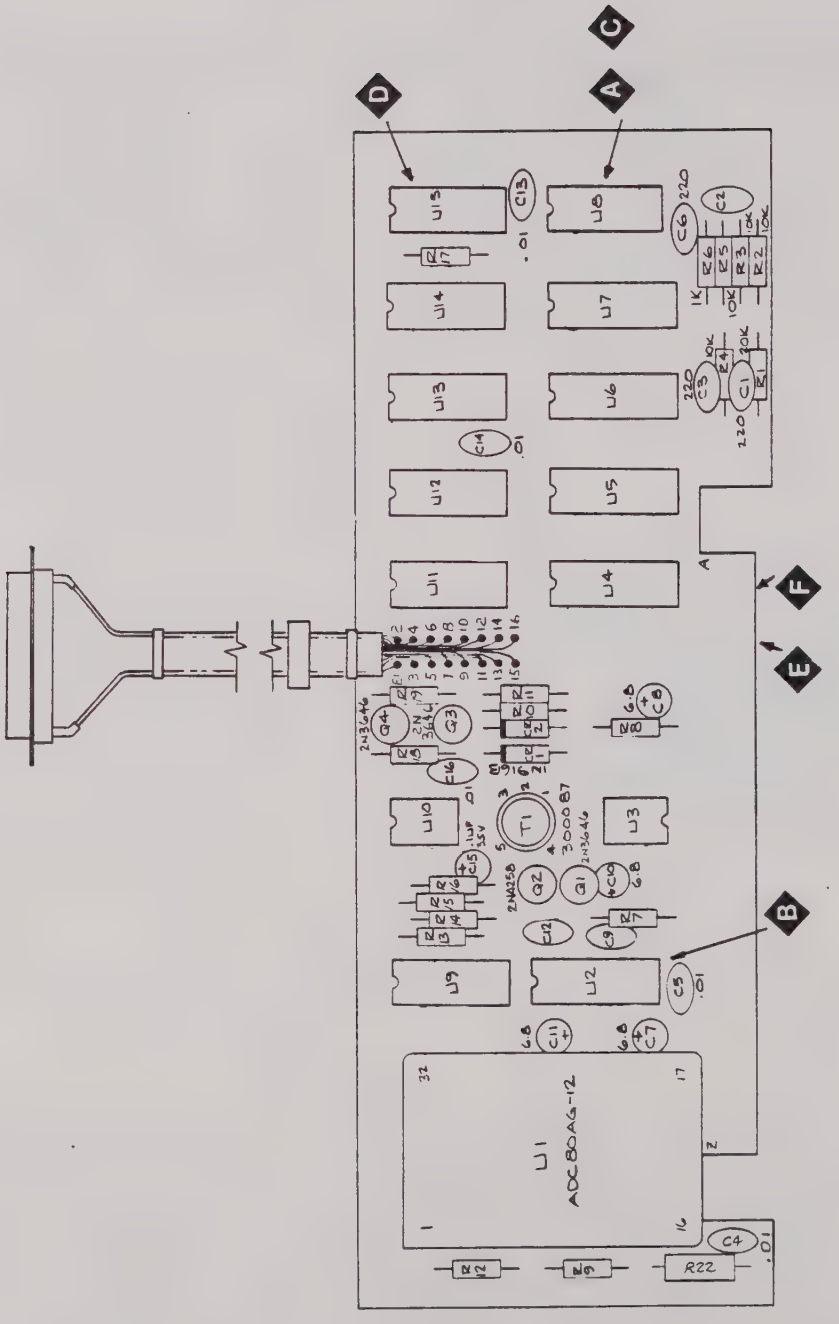


Figure 6.22 - Fast Waveform Digitizer Component Location Diagram

Table 6.16 - Digitizer Subassembly Performance Test

Input and Control Setting	Signal Nomenclature	Reference Designation	Test Point	Illustration Reference	Performance Standard
Function: DC Range: Auto Input Terminals: +10V DC Select 4-1/2 Digit Mode (#DIG, 4)	All waveforms are synced to the negative edge of the waveform at TP2.				
	Signal integrate	TP3	A	Figure 6.23	Waveform 1
	Integrator input	TP4	B	Figure 6.23	Waveform 2
	Integrator output	TP5	C	Figure 6.23	Waveform 3
	Null detector output	TP1	D	Figure 6.23	Waveform 4
	Reset FET drive signal	TP2	E	Figure 6.23	Waveform 5
Function: DC Range: Auto Input Terminals: +10V DC Select 5-1/2 Digit Mode (#DIG, 5)	All waveforms are synced to the negative edge of the waveform at TP2.				
	Signal integrate	TP3	A	Figure 6.23	Waveform 6
	Integrator input	TP4	B	Figure 6.23	Waveform 7
	Integrator output	TP5	C	Figure 6.23	Waveform 8
	Null detector output	TP1	D	Figure 6.23	Waveform 9
	Reset FET drive signal	TP2	E	Figure 6.23	Waveform 10

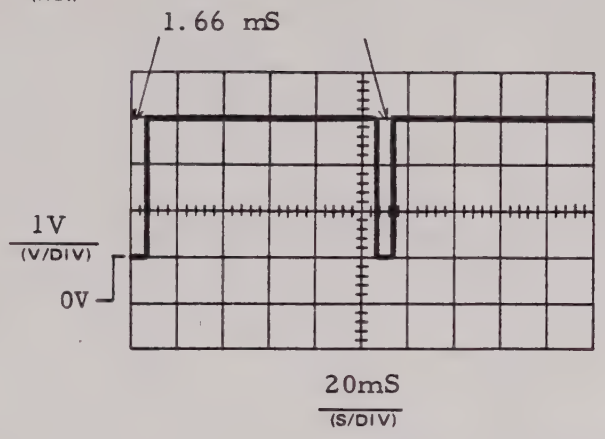
Table 6.16 - Digitizer Subassembly Performance Test (Continued)

Input and Control Setting	Signal Nomenclature	Reference Designation	Test Point	Illustration Reference	Performance Standard
Function: DC Range: Auto Input Terminals: +10V DC Select 6-1/2 Digit Mode (#DIG, 6)	All waveforms are synced to the negative edge of the waveform at TP2.				
	Signal integrate	TP3	A	Figure 6.23	Waveform 11
	Integrator input	TP4	B	Figure 6.23	Waveform 12
	Integrator output	TP5	C	Figure 6.23	Waveform 13
	Null detector output	TP1	D	Figure 6.23	Waveform 14
	Reset FET drive signal	TP2	E	Figure 6.23	Waveform 15

WAVEFORMS FOR TABLE 6.16

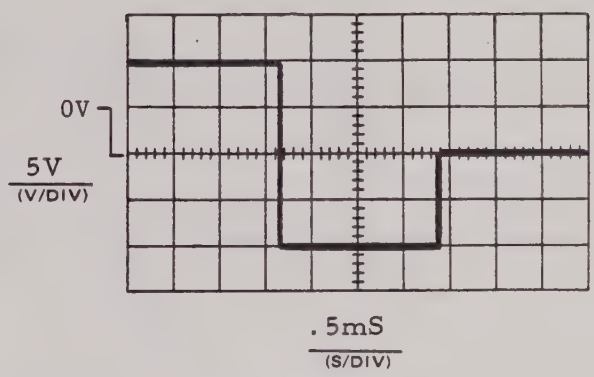
1 (NO.)

SIG. INT.



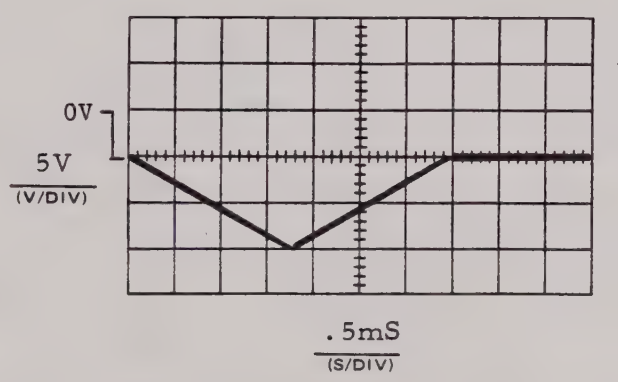
2 (NO.)

INT. IN.



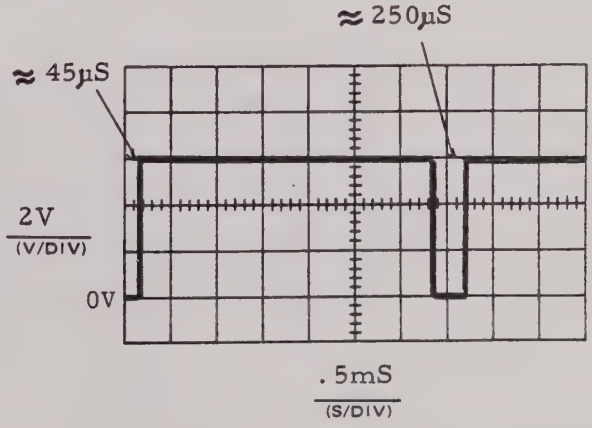
3 (NO.)

INT. OUT



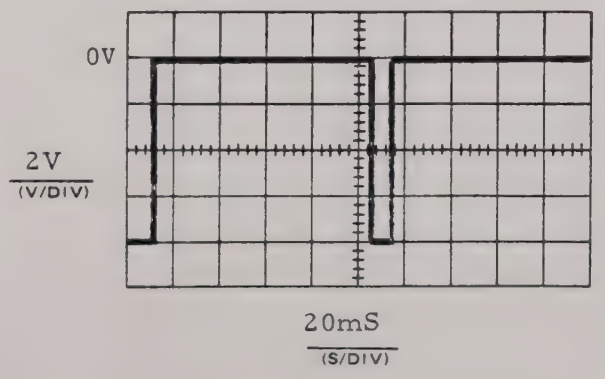
4 (NO.)

N.D. OUT



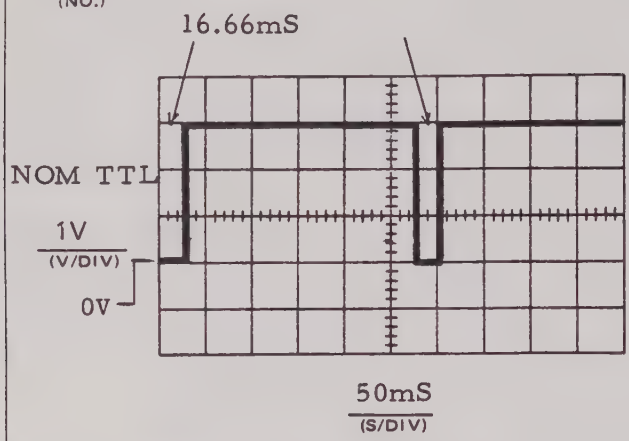
5 (NO.)

RESET FET DRIVE

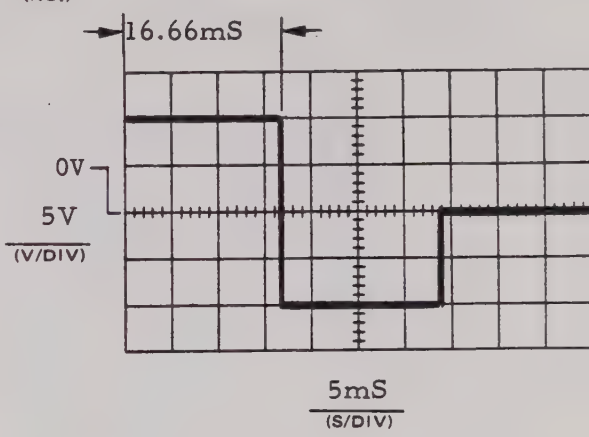


WAVEFORMS FOR TABLE 6.16 (Continued)

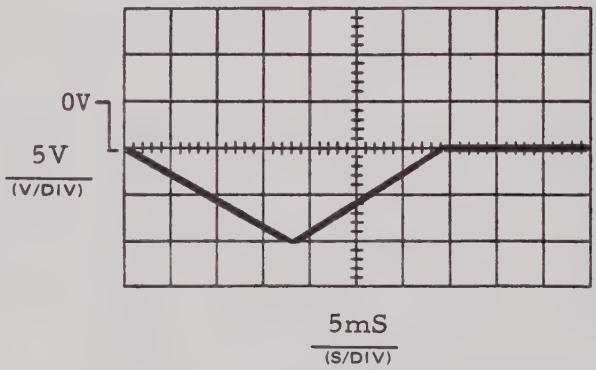
6 (NO.)



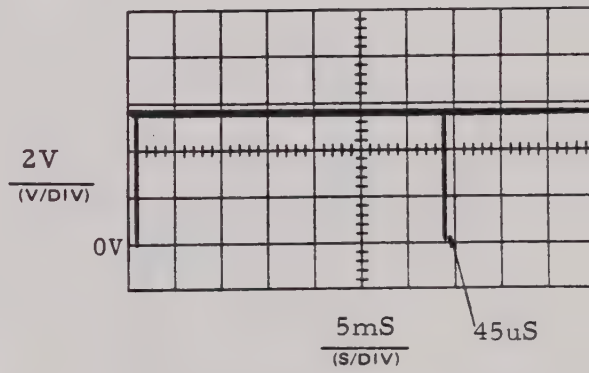
7 (NO.) INT IN.



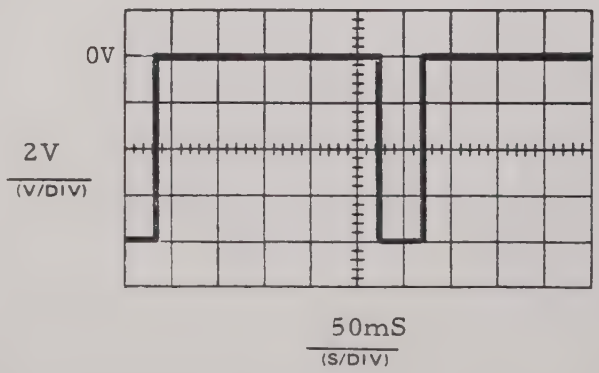
8 (NO.) INT. OUT



9 (NO.) N.D. OUT

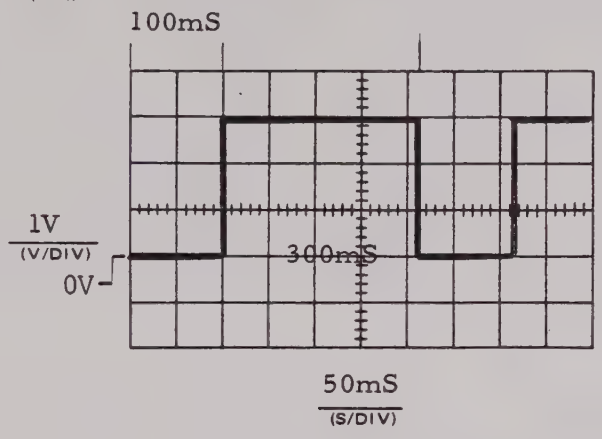


10 (NO.) RESET

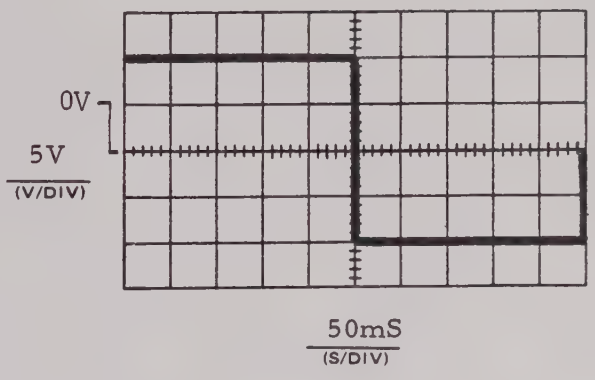


WAVEFORMS FOR TABLE 6.16 (Continued)

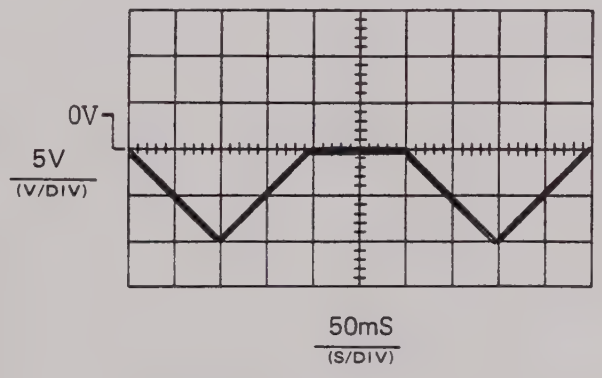
11 (NO.) SIG. INT.



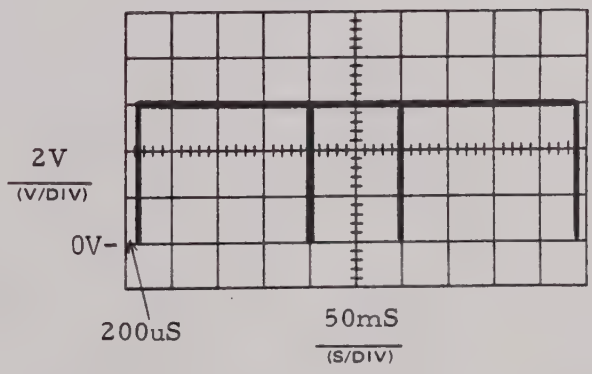
12 (NO.) INT. IN.



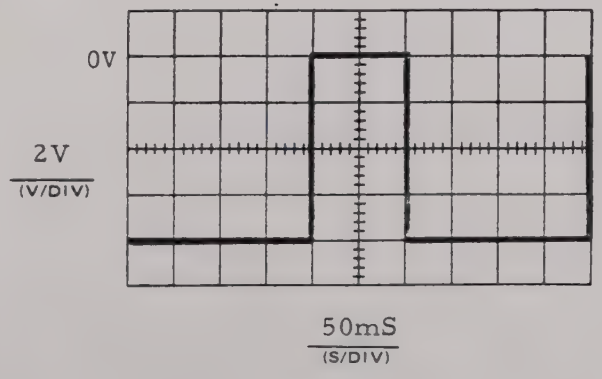
13 (NO.) INT. OUT



14 (NO.) N.D. OUT



15 (NO.) RESET FET DRIVE



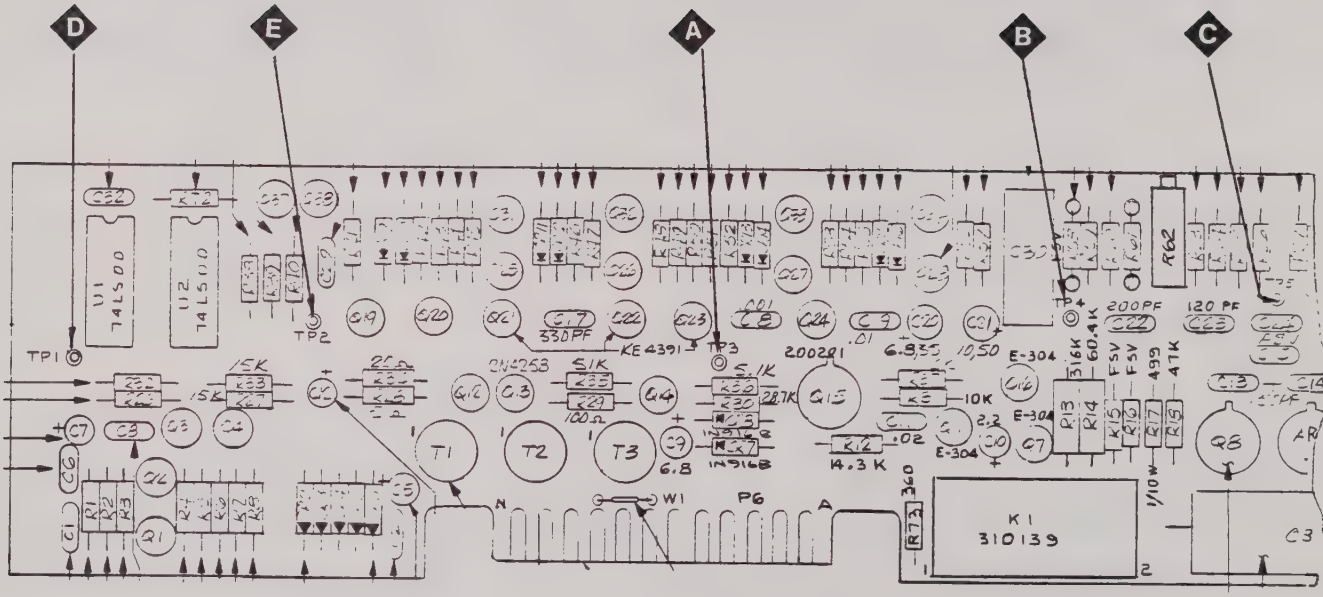


Figure 6.23 - Digitizer Component Location Diagram

Table 6.17 - Isolator Subassembly Performance Test

Input and Control Setting	Signal Nomenclature	Reference Designation	Test Point	Illustration Reference	Performance Standard
Function: DC Range: Auto Input Terminals: +10V DC	All measurements are referenced to Analog Common (Mecca).				
	Gain Stage output	TP3	1	Figure 6.24	+10.0 VDC
	Boot strap Amp output	TP4	2	Figure 6.24	+10.0 VDC
	+10V BS	AR4-7	3	Figure 6.24	+21.0 VDC
	–10V BS	AR4-4	4	Figure 6.24	−1.0 VDC
	Isolator output	TP2	5	Figure 6.24	+10.0 VDC

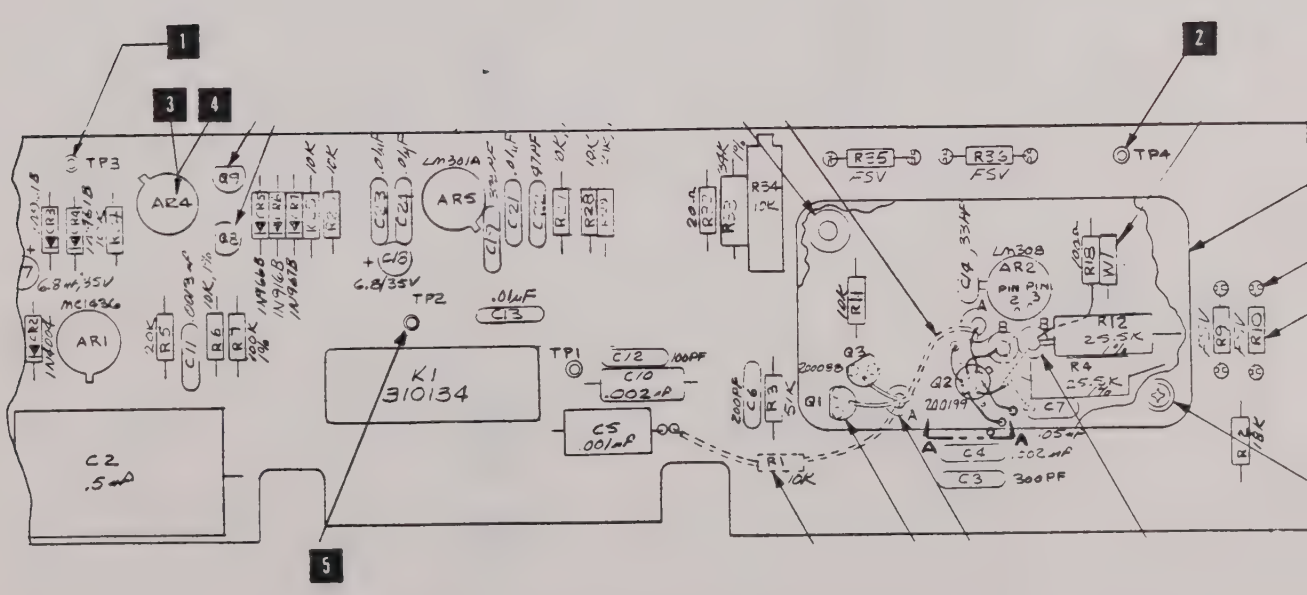


Figure 6.24 - Isolator Component Location Diagram

Table 6.18 - Ohms Subassembly Performance Test

Input and Control Setting	Signal Nomenclature	Reference Designation	Test Point	Illustration Reference	Performance Standard
Function: Ohms	All measurements are referenced to Analog Common (Mecca). All resistance inputs are resistance standards.				
Range: 10Ω Input Terminals: 10Ω	Clamped input	TP1	1	Figure 6.25	+8.0V
	Current generator output	TP3	2	Figure 6.25	+3.7V
	Ohms Amp output	TP4	3	Figure 6.25	–0.1V
Range: 100Ω Input Terminals: 100Ω	Clamped input	TP1	1	Figure 6.25	+8.0V
	Current generator output	TP3	2	Figure 6.25	+3.7V
	Ohms Amp output	TP4	3	Figure 6.25	–1.0V
Range: 1KΩ Input Terminals: 1KΩ	Clamped input	TP1	1	Figure 6.25	+7.999V
	Current generator output	TP3	2	Figure 6.25	+3.0V
	Ohms Amp output	TP4	3	Figure 6.25	–1.0V
Range: 100KΩ Input Terminals: 100KΩ	Clamped input	TP1	1	Figure 6.25	+8.0V
	Current generator output	TP3	2	Figure 6.25	+6.9V
	Ohms Amp output	TP4	3	Figure 6.25	–10.0V

Table 6.18 - Ohms Subassembly Performance Test (Continued)

Input and Control Setting	Signal Nomenclature	Reference Designation	Test Point	Illustration Reference	Performance Standard
Range: • 10MΩ Input Terminals: 10MΩ	Clamped input	TP1	1	Figure 6.25	+8.0V
	Current generator output	TP3	2	Figure 6.25	+6.9V
	Ohms Amp output	TP4	3	Figure 6.25	−10.0V

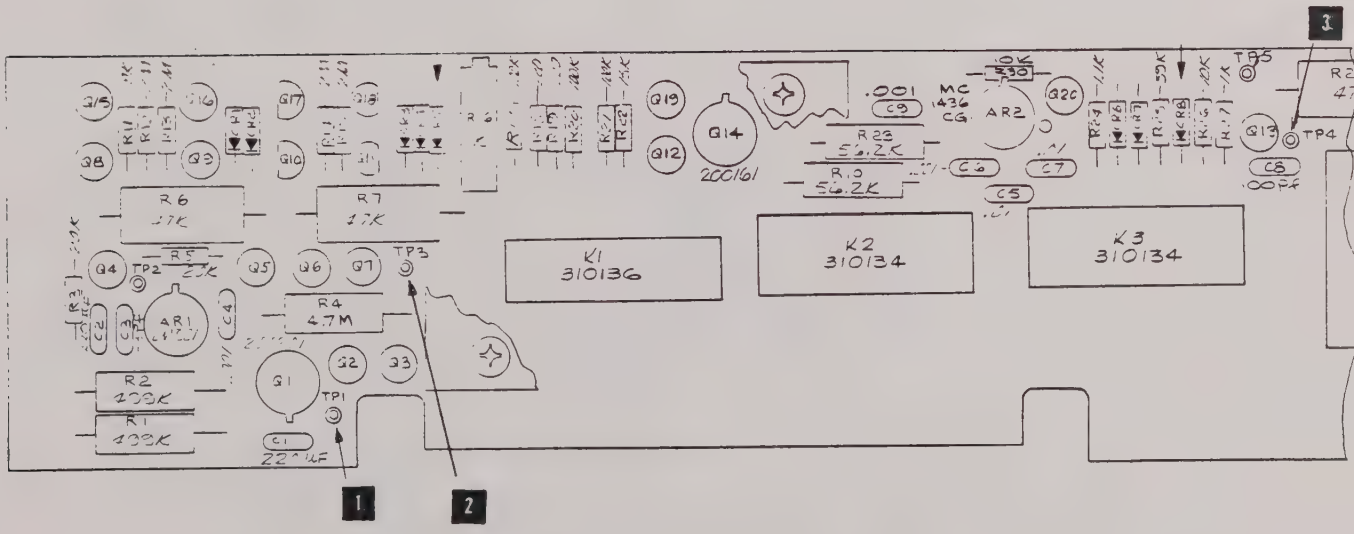


Figure 6.25 - Ohms Component Location Diagram

Table 6.19 - Ohms Reference Subassembly Performance Test

Input and Control Setting	Signal Nomenclature	Reference Designation	Test Point	Illustration Reference	Performance Standard
Function: Ohms	All measurements are referenced to Analog Common (Mecca).				
	Ohms Reference	AR1-6	1	Figure 6.26	+12.0V
		R5/R4	2	Figure 6.26	+8.0V

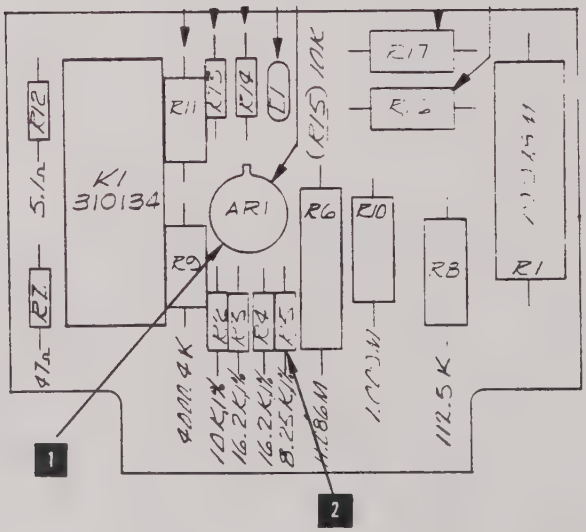


Figure 6.26 - Ohms Reference Component Location Diagram

Table 6.20 - Preamplifier Subassembly Performance Test

Input and Control Setting	Signal Nomenclature	Reference Designation	Test Point	Illustration Refcrence	Performance Standard
Function: DC Range: mV Input Terminals: +0.01 VDC	All measurements are referenced to Analog Common (Mecca). Waveforms are synced to the negative edge of the signal at Q8-C.				
	MOD/DEMOD Drive	Q9-C	A	Figure 6.27	Waveform 1
	Input filter output	E15	1	Figure 6.27	
	Feedback	C9/Q1-D	B	Figure 6.27	Waveform 2
	Sync Demod output	C2/R4	C	Figure 6.27	Waveform 3
	Preamplifier output	E3	2	Figure 6.27	+7.2 VDC

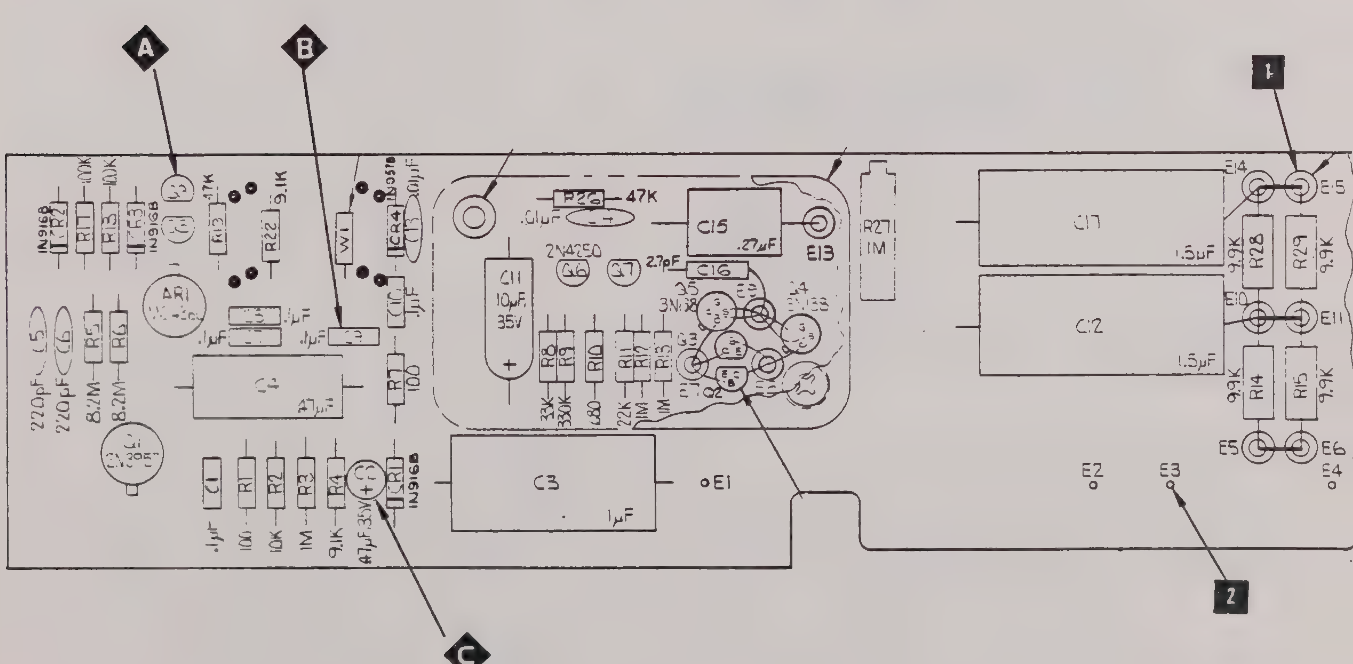
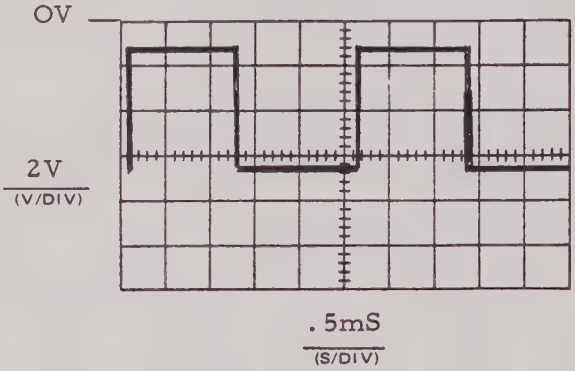


Figure 6.27 - Preamplifier Component Location Diagram

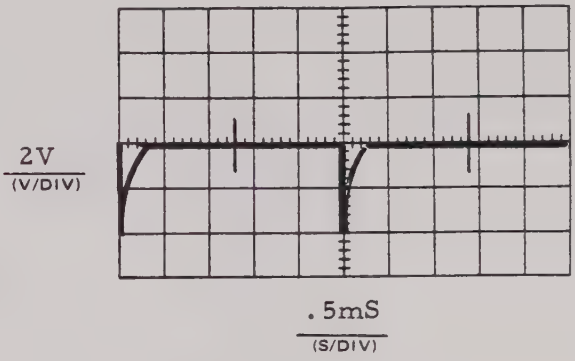
WAVEFORMS FOR TABLE 6.20

1
(NO.)



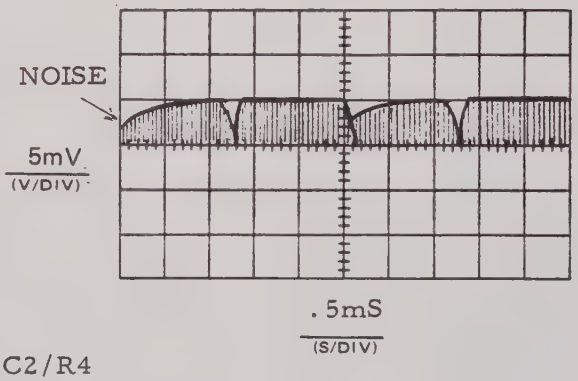
Q9-C

2
(NO.)



C9-Q1-D

3
(NO.)



C2/R4

Table 6.21 - Attenuator/Reference Subassembly Performance Test

Input and Control Setting	Signal Nomenclature	Reference Designation	Test Point	Illustration Reference	Performance Standard
Press SHIFT and FR/# DIGITS Keys	Measurements 1 and 2 are referenced to Digital Ground.				
	Front/rear relay control	U1-10	1	Figure 6.28	Low logic level when RI indicator on front panel lit. High logic level when RI not lit.
Press AC Key	AC relay control	U1-15	2	Figure 6.28	Low logic level
	Measurements 3 thru 5 are referenced to Analog Common (Mecca).				
	Zener reference	TP1	3	Figure 6.28	+6.2V
	+10V reference output	TP2	4	Figure 6.28	+10.000 VDC
	−10V reference output	Q1-E	5	Figure 6.28	−10.000 VDC

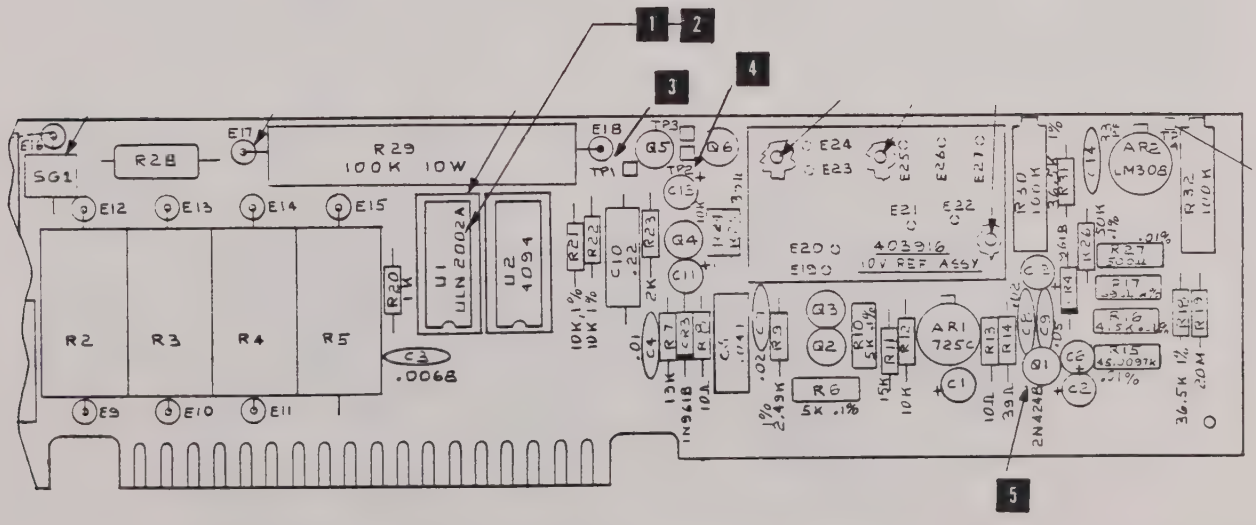


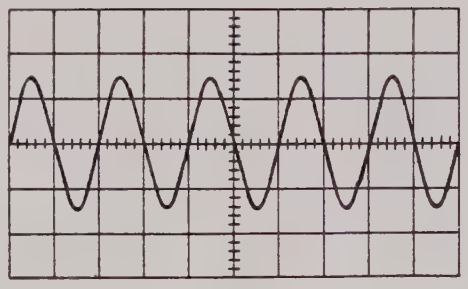
Figure 6.28 - Attenuator/Reference Component Location Diagram

Table 6.22 - RMS Converter Subassembly Performance Test

Input and Control Setting	Signal Nomenclature	Reference Designation	Test Point	Illustration Reference	Performance Standard
Function: AC Range: 1 Volt Input Terminals: Connect +IN to –IN with a copper wire jumper	All measurements are referenced to Analog Common (Mecca).				
		TP4	1	Figure 6.29	0.0 VDC
		Q16-C	2	Figure 6.29	0.9 VDC
		TP2	3	Figure 6.29	0.0 VDC
	Scaling Amp input	J304-1	4	Figure 6.29	0.0 VDC
	Scaling Amp output	TP3	5	Figure 6.29	0.0 VDC
	RMS Converter Amp output	AR1-6	6	Figure 6.29	0.0 VDC
	RMS Converter output	J304-12	7	Figure 6.29	0.0 VDC
Range: 10V Remove jumper. Connect input to a signal generator set for 10V RMS @ 1 KHz	All waveforms are synced to the positive edge of the internal sync.				
	Scaling Amp output	TP3	A	Figure 6.29	Waveform 1
	Absolute Value output	TP4	B	Figure 6.29	Waveform 2
	Log Amp	Emitters of Q3	C	Figure 6.29	Waveform 3
	Output Amp	AR1 pin 6 (Scope AC coupled)	D	Figure 6.29	Waveform 4

WAVEFORMS FOR TABLE 6.22

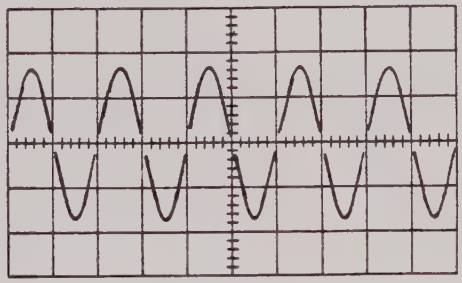
1 (NO.) TP-3



1V (V/DIV)

.5mS (S/DIV)

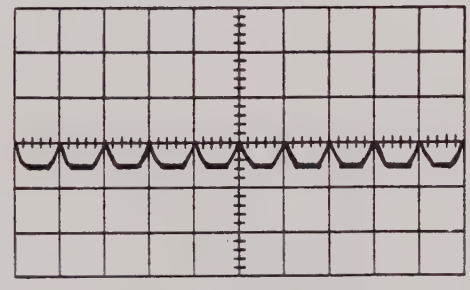
2 (NO.) TP-4



1V (V/DIV)

.5mS (S/DIV)

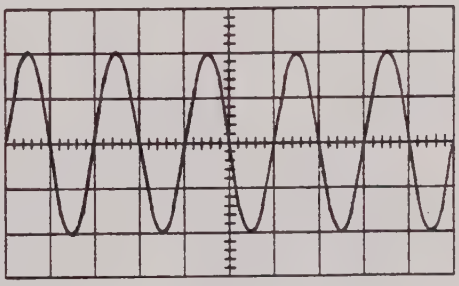
3 (NO.) Q3 EMITTERS



.5V (V/DIV)

.5mS (S/DIV)

4 (NO.) AR1 PIN 6



20mV (V/DIV)

.5mS (S/DIV)

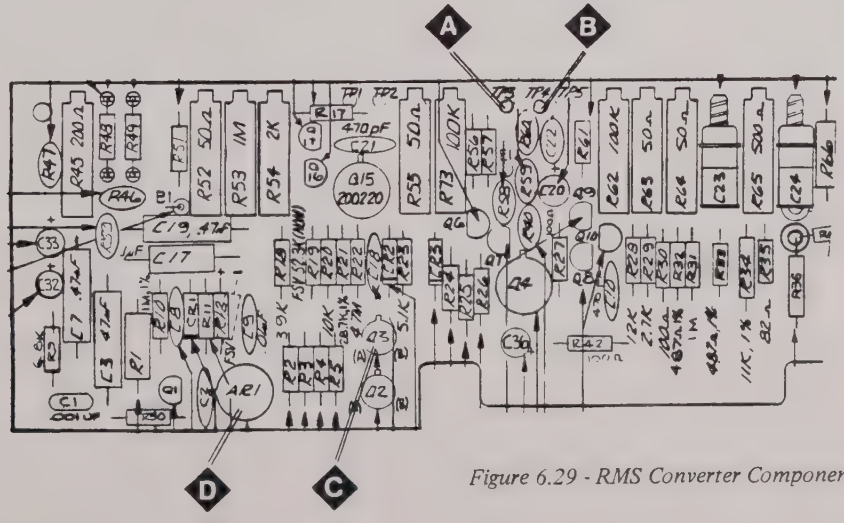
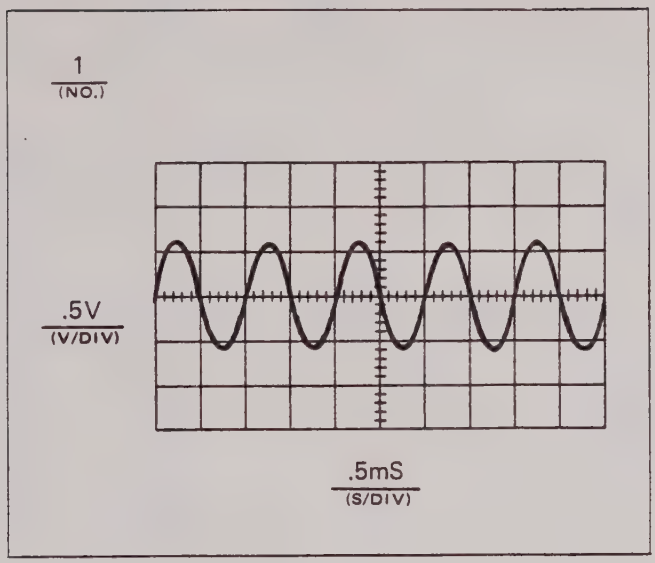


Figure 6.29 - RMS Converter Component Location Diagram

Table 6.23 - Scaling Amplifier Subassembly Performance Test

Input and Control Setting	Signal Nomenclature	Reference Designation	Test Point	Illustration Reference	Performance Standard
All waveforms are synced to the positive edge of the internal sync.					
Function: AC Range: 1 Volt Connect input to a signal generator set for 1.0V RMS at 1 KHz	Scaling Amp output	C46 (minus side)	A	Figure 6.30	Waveform 1
Function: AC Range: 10 Volts Connect input to a signal generator set for 10V RMS at 1 KHz	Scaling Amp output	C46 (minus side)	A	Figure 6.30	Waveform 1
Function: AC Range: 100 Volts Connect input to a signal generator set for 100V RMS at 1 KHz	Scaling Amp output	C46 (minus side)	A	Figure 6.30	Waveform 1
Function: AC Range: 1KV Connect input to a signal generator set for 1 KV RMS at 1 KHz	Scaling Amp	C46 (minus side)	A	Figure 6.30	Waveform 1

WAVEFORM FOR TABLE 6.23



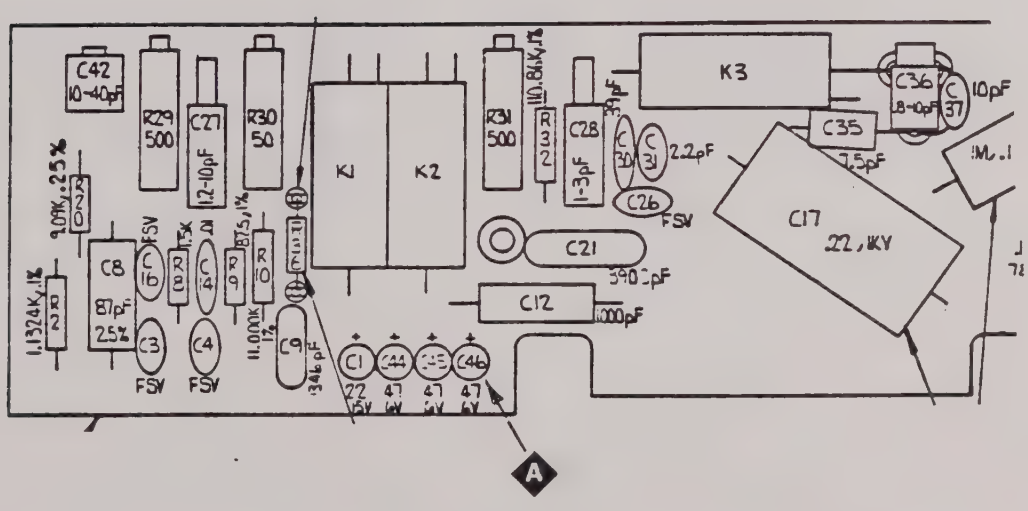


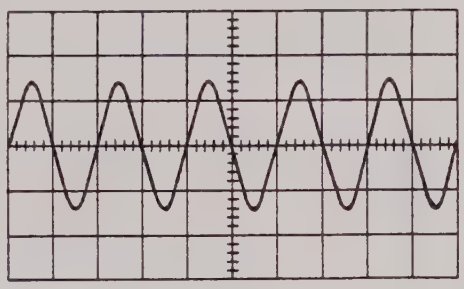
Figure 6.30 - Scaling Amplifier Component Location Diagram

Table 6.24 - AC Averaging Converter Subassembly Performance Test

Input and Control Setting	Signal Nomenclature	Reference Designation	Test Point	Illustration Reference	Performance Standard
Function: AC Range: 10 Volts Input Terminals: Connect +IN to –IN with copper wire jumper	All measurements are referenced to Analog Common (Mecca).				
	Converter input	TP3	1	Figure 6.31	0.0 VDC (nominal)
	Absolute Value output	TP7	2	Figure 6.31	0.0 VDC (nominal)
	Halfwave output	TP6	3	Figure 6.31	0.0 VDC (nominal)
	Converter output	TP4	4	Figure 6.31	0.0 VDC (nominal)
Remove jumper. Connect input to a signal generator set for 1.9V RMS at 1 KHz	All waveforms are synced to the positive edge of the internal sync.				
	Converter input	TP3	A	Figure 6.31	Waveform 1
	Absolute Value output	TP7	B	Figure 6.31	Waveform 2
	Halfwave output	TP6	C	Figure 6.31	Waveform 3
	Converter output	TP4	D	Figure 6.31	Waveform 4

WAVEFORMS FOR TABLE 6.24

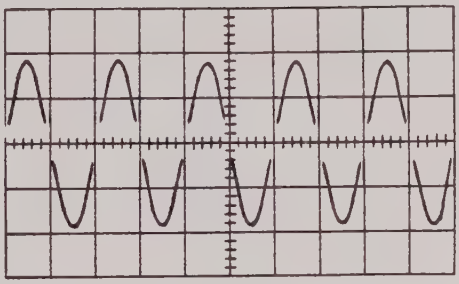
1 (NO.) TP3



1V (V/DIV)

.5mS (S/DIV)

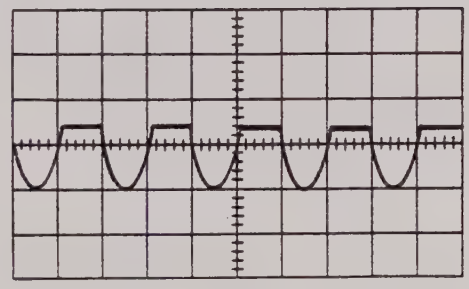
2 (NO.) TP7



2V (V/DIV)

.5mS (S/DIV)

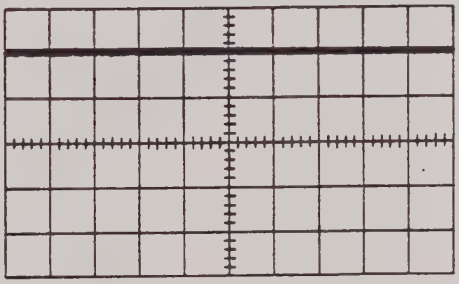
3 (NO.)



2V (V/DIV)

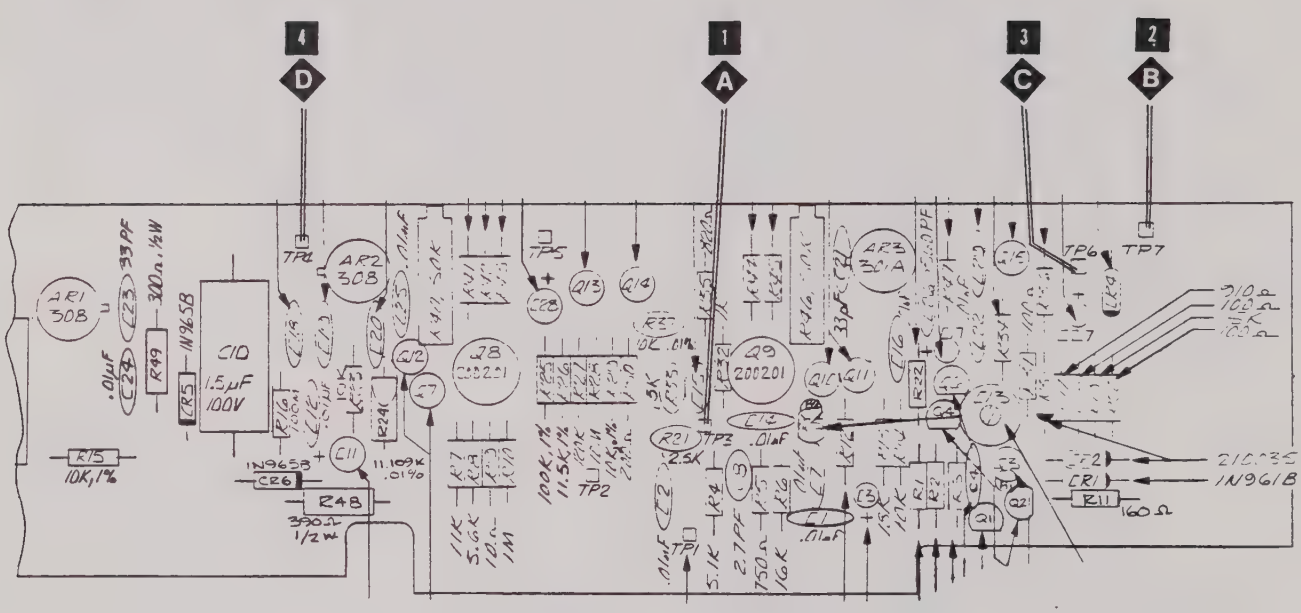
.5mS (S/DIV)

4 (NO.)



.5V (V/DIV)

.5mS (S/DIV)


4
D
1
A
3
C
2
B
TP4
TP5
TP6
TP7
TP1
TP2
TP3
AR1
308
AR2
308
AR3
308
C10
1.5µF
100V
.01µF
C23
33PF
R49
300Ω, ½W
CR5
IN9638
R15
10K, 1%
CR6
IN9638
C11
R48
390Ω
1/2W
R24
10K
Q8
2N3251
Q9
2N2907
Q10
Q11
R21
2.5K
TP3
.01µF
C14
R22
C16
R1
C1
.01µF
Q1
Q2
C15
R11
160Ω
CR1
IN9618
R16
10K
C18
.01µF
C19
.01µF
C20
.01µF
C21
.01µF
C22
.01µF
C24
.01µF
C25
.01µF
C26
.01µF
C27
.01µF
C28
.01µF
C29
.01µF
C30
.01µF
C31
.01µF
C32
.01µF
C33
.01µF
C34
.01µF
C35
.01µF
C36
.01µF
C37
.01µF
C38
.01µF
C39
.01µF
C40
.01µF
C41
.01µF
C42
.01µF
C43
.01µF

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Option 55

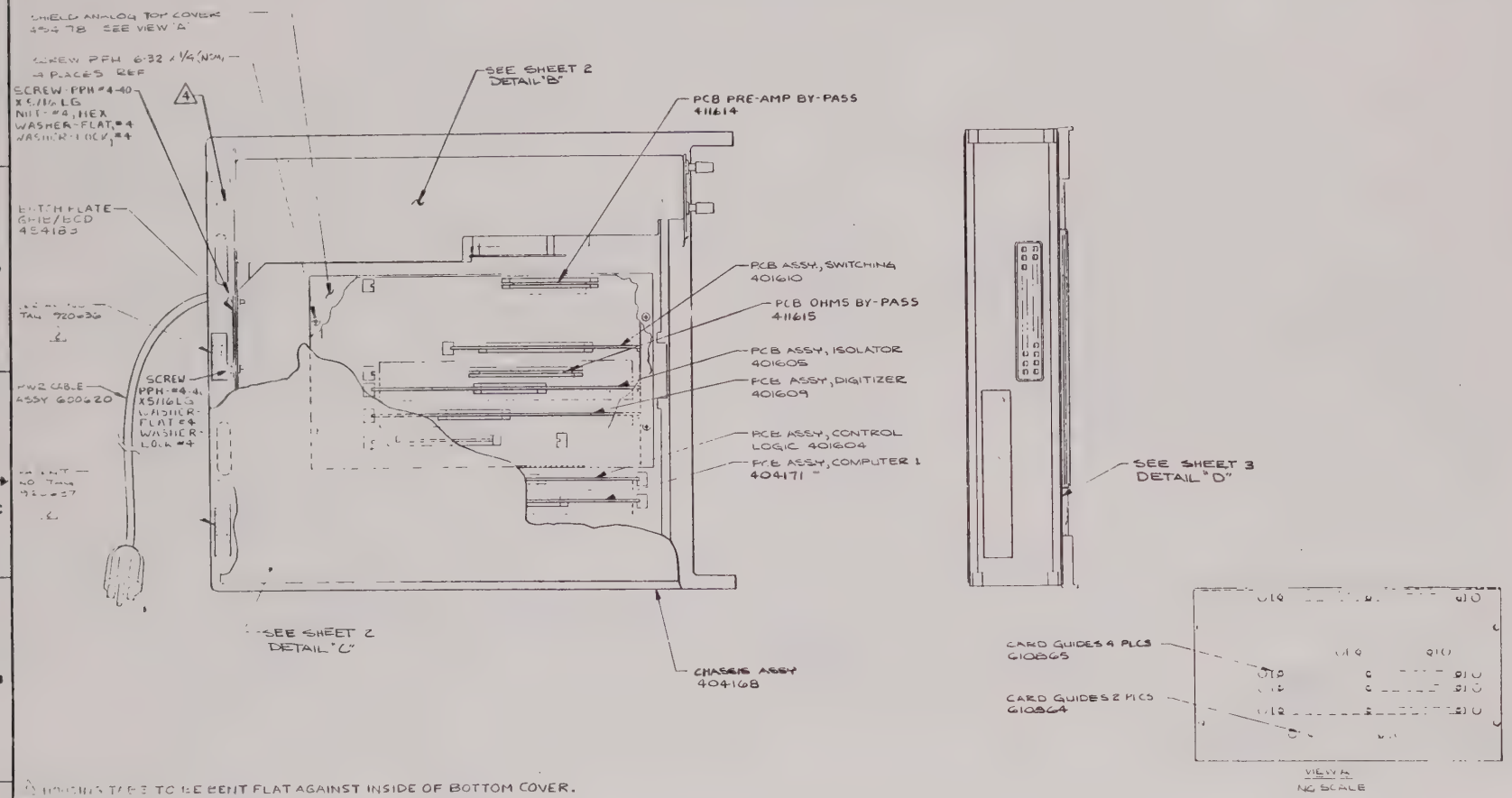
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SHIELD ANALOG TOP COVER 404178 SEE VIEW A
SCREW PPH 6-32 x 1/4 (NOM) 4 PLACES REF
SCREW PPH #4-40 X 5/16 LG NUT #4 HEX WASHER-FLAT #4 WASHER-LOCK #4
SEE SHEET 2 DETAIL "B"
PCB PRE-AMP BY-PASS 411614
PCB ASSY, SWITCHING 401610
PCB OHMS BY-PASS 411615
PCB ASSY, ISOLATOR 401605
PCB ASSY, DIGITIZER 401609
PCB ASSY, CONTROL LOGIC 401604
PCB ASSY, COMPUTER 1 404171
SEE SHEET 3 DETAIL "D"
SEE SHEET 2 DETAIL "C"
CHASSIS ASSY 404168
CARD GUIDES 4 PLCS 610865
CARD GUIDES 2 PLCS 610864
VIEW A NO SCALE

1. ASSEMBLE PER RACAL-DANA WORKMANSHIP MANUAL.
3. REMOVE PROTECTIVE BACKING FROM FOAM PAD, ROUND + RECTANGULAR BUMPERS + ATTACH TO INSIDE OF TOP OR BOTTOM COVER AS SHOWN
4. AFTER INSTALLATION OF CAL MODULE ASSY SECURE LATCH ON REAR PANEL TO BASE PLATE.
5. TYPE PERTINENT DATA ON SERIAL NO LABEL, ATTACH SERIAL & PATENT NO LABELS TO BOTTOM FRAME APPROX AS SHOWN.

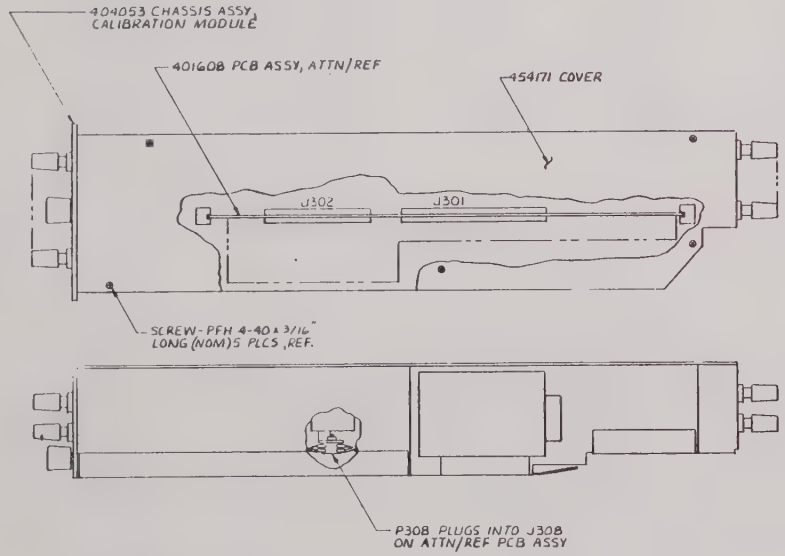
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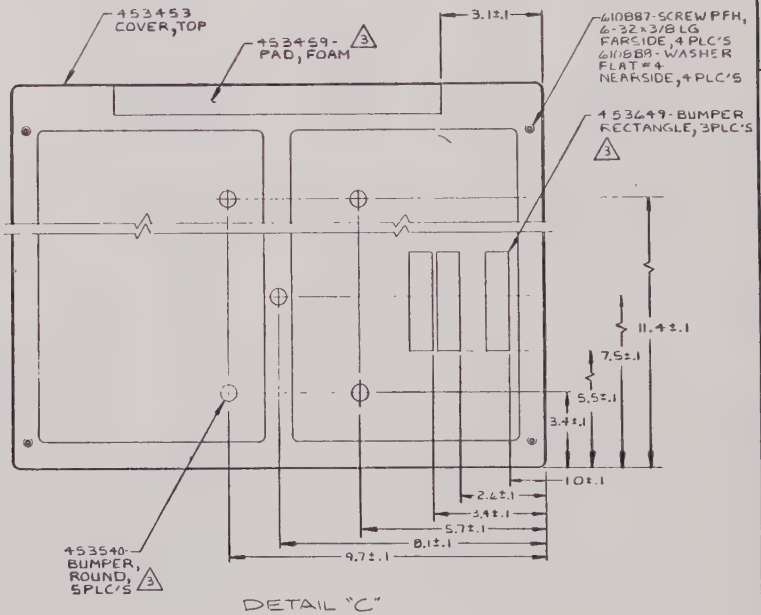
MULTIMETER ASSY, DIGITAL, 6000

SIZE	CODE IDENT NO	DWG NO	REV
D	21793	404193	A

SCALE NONE SHEET 1 OF 2


404053 CHASSIS ASSY, CALIBRATION MODULE
401608 PCB ASSY, ATTN/REF
454171 COVER
J302
J301
SCREW-PFH 4-40 x 3/16" LONG (NOM) 5 PLCS, REF.
P308 PLUGS INTO J308 ON ATTN/REF PCB ASSY

DETAIL "B"



DETAIL "C"

PROPRIETARY NOTICE

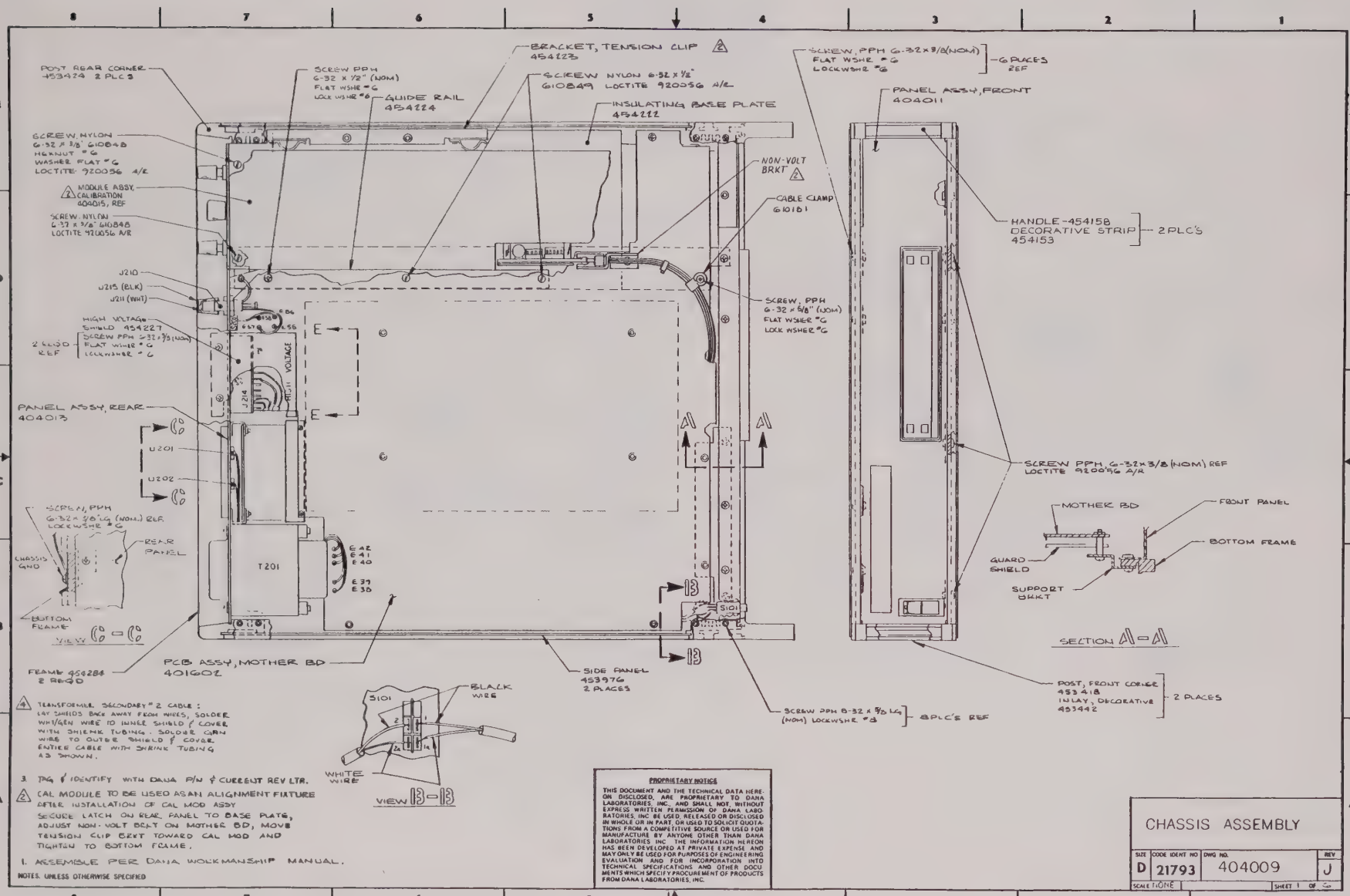
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NOTES UNLESS OTHERWISE SPECIFIED

MULTIMETER ASSY, DIGITAL, 6,000

SIZE	CODE IDENT NO	DWG NO	REV
D	21793	404193	A

SCALE FULL SHEET 2 OF 5


POST REAR CORNER 453424 2 PLCS
SCREW PPH 6-32 X 1/2" (NOM) FLAT WSHR #6 LOCK WSHR #6
GUIDE RAIL 454224
BRACKET, TENSION CLIP 454223
SCREW NYLON 6-32 X 1/2" 610849 LOCTITE 920056 A/R
INSULATING BASE PLATE 454222
SCREW, PPH 6-32 X 3/8 (NOM) FLAT WSHR #6 LOCKWSHR #6 — 6 PLACES REF
PANEL ASSY, FRONT 404011
SCREW, NYLON 6-32 X 3/8" 610848 HEXNUT #6 WASHER FLAT #6 LOCTITE 920056 A/R
MODULE ASSY CALIBRATION 604015, REF
SCREW NYLON 6-32 X 3/8" 610848 LOCTITE 920056 A/R
NON-VOLT BRKT
CABLE CLAMP 610181
HANDLE-454158 DECORATIVE STRIP 454153 — 2 PLC'S
J210
J215 (BLK)
J211 (WHT)
HIGH VOLTAGE SHIELD 454227
SCREW PPH 6-32 X 3/8 (NOM) FLAT WSHR #6 LOCKWSHR #6 — 2 REQD REF
SCREW, PPH 6-32 X 5/8" (NOM) FLAT WSHR #6 LOCK WSHR #6
PANEL ASSY, REAR 404013
SCREW PPH 6-32 X 3/8 (NOM) REF LOCTITE 920056 A/R
J201
J202
MOTHER BD
FRONT PANEL
SCREW, PPH 6-32 X 3/8 LG (NOM.) REF LOCKWSHR #6
REAR PANEL
CHASSIS GND
BOTTOM FRAME
GUARD SHIELD
SUPPORT BRKT
BOTTOM FRAME VIEW
SECTION A-A
FRAME 453284 2 REQD
PCB ASSY, MOTHER BD 401602
SIDE PANEL 453976 2 PLACES
SCREW PPH 6-32 X 5/8 LG (NOM) LOCKWSHR #6 — 8 PLC'S REF
POST, FRONT CORNER 453418 INLAY, DECORATIVE 453442 — 2 PLACES
S101
BLACK WIRE
WHITE WIRE
VIEW B-B

4. TRANSFORMER SECONDARY #2 CABLE: LAY SHIELDS BACK AWAY FROM WIRES, SOLDER WHT/GRN WIRE TO INNER SHIELD & COVER WITH SHRINK TUBING. SOLDER GRN WIRE TO OUTER SHIELD & COVER ENTIRE CABLE WITH SHRINK TUBING AS SHOWN.

3. TAG & IDENTIFY WITH DANA P/N & CURRENT REV LTR.

2. CAL MODULE TO BE USED AS AN ALIGNMENT FIXTURE AFTER INSTALLATION OF CAL MOD ASSY SECURE LATCH ON REAR PANEL TO BASE PLATE, ADJUST NON-VOLT BRKT ON MOTHER BD, MOVE TENSION CLIP BRKT TOWARD CAL MOD AND TIGHTEN TO BOTTOM FRAME.

1. ASSEMBLE PER DANA WORKMANSHIP MANUAL.

NOTES: UNLESS OTHERWISE SPECIFIED

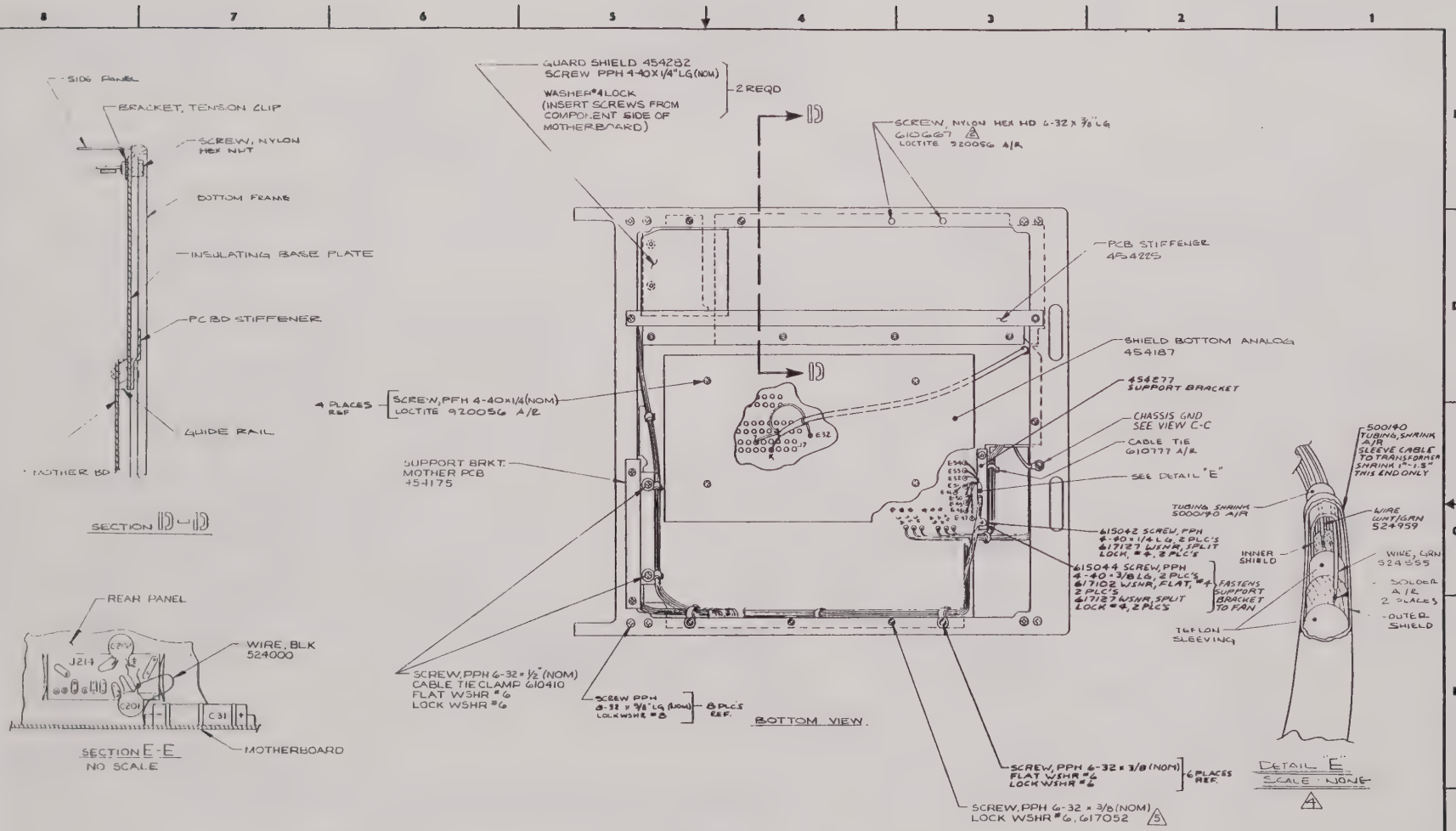
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CHASSIS ASSEMBLY

SIZE	CODE IDENT NO	DWG NO.	REV
D	21793	404009	J

SCALE NONE — SHEET 1 OF 2


SIDE PANEL
BRACKET, TENSION CLIP
SCREW, NYLON HEX NUT
BOTTOM FRAME
INSULATING BASE PLATE
PC BD STIFFENER
GUIDE RAIL
MOTHER BD
SECTION D-D
GUARD SHIELD 454282
SCREW PPH 4-40X1/4"LG(NOM)
WASHER #4 LOCK
(INSERT SCREWS FROM COMPONENT SIDE OF MOTHERBOARD)
2 REQD
SCREW, NYLON HEX HD 6-32 X 3/8 LG
610667 A
LOCTITE 920056 A/R
PCB STIFFENER 454285
SHIELD BOTTOM ANALOG 454187
454277 SUPPORT BRACKET
4 PLACES REF
SCREW, PPH 4-40X1/4(NOM)
LOCTITE 920056 A/R
CHASSIS GND SEE VIEW C-C
CABLE TIE 610777 A/R
SUPPORT BRKT. MOTHER PCB 454175
SEE DETAIL "E"
500140 TUBING, SHRINK A/R SLEEVE CABLE TO TRANSFORMER SHRINK 1"-1.5" THIS END ONLY
TUBING, SHRINK 500140 A/R
WIRE, WHT/GRN 524959
INNER SHIELD
WIRE, GRN 524955
SOLDER A/R 2 PLACES
OUTER SHIELD
615042 SCREW, PPH 4-40 X 1/4 LG, 2 PLC'S 617127 WSHR, SPLIT LOCK, #4, 2 PLC'S
615044 SCREW, PPH 4-40 X 3/8 LG, 2 PLC'S 617102 WSHR, FLAT, #4, 2 PLC'S 617127 WSHR SPLIT LOCK #4, 2 PLC'S
FASTENS SUPPORT BRACKET TO FAN
TEFLON SLEEVING
REAR PANEL
WIRE, BLK 524000
J214
C31
J204
SECTION E-E
NO SCALE
MOTHERBOARD
SCREW, PPH 6-32 X 1/2" (NOM) CABLE TIE CLAMP 610410 FLAT WSHR #6 LOCK WSHR #6
SCREW PPH 8-32 X 5/8" LG (NOM) LOCK WSHR #8
8 PLCS REF.
BOTTOM VIEW.
SCREW, PPH 6-32 X 3/8 (NOM) FLAT WSHR #6 LOCK WSHR #6
6 PLACES REF.
SCREW, PPH 6-32 X 3/8 (NOM) LOCK WSHR #6, 617052
5
DETAIL "E"
SCALE - NONE
4

⚠ ELECTRICAL CONTINUITY TO EXIST BETWEEN WASHER AND FRAME.

NOTES: UNLESS OTHERWISE SPECIFIED (CONTINUED FROM SHT. #1)

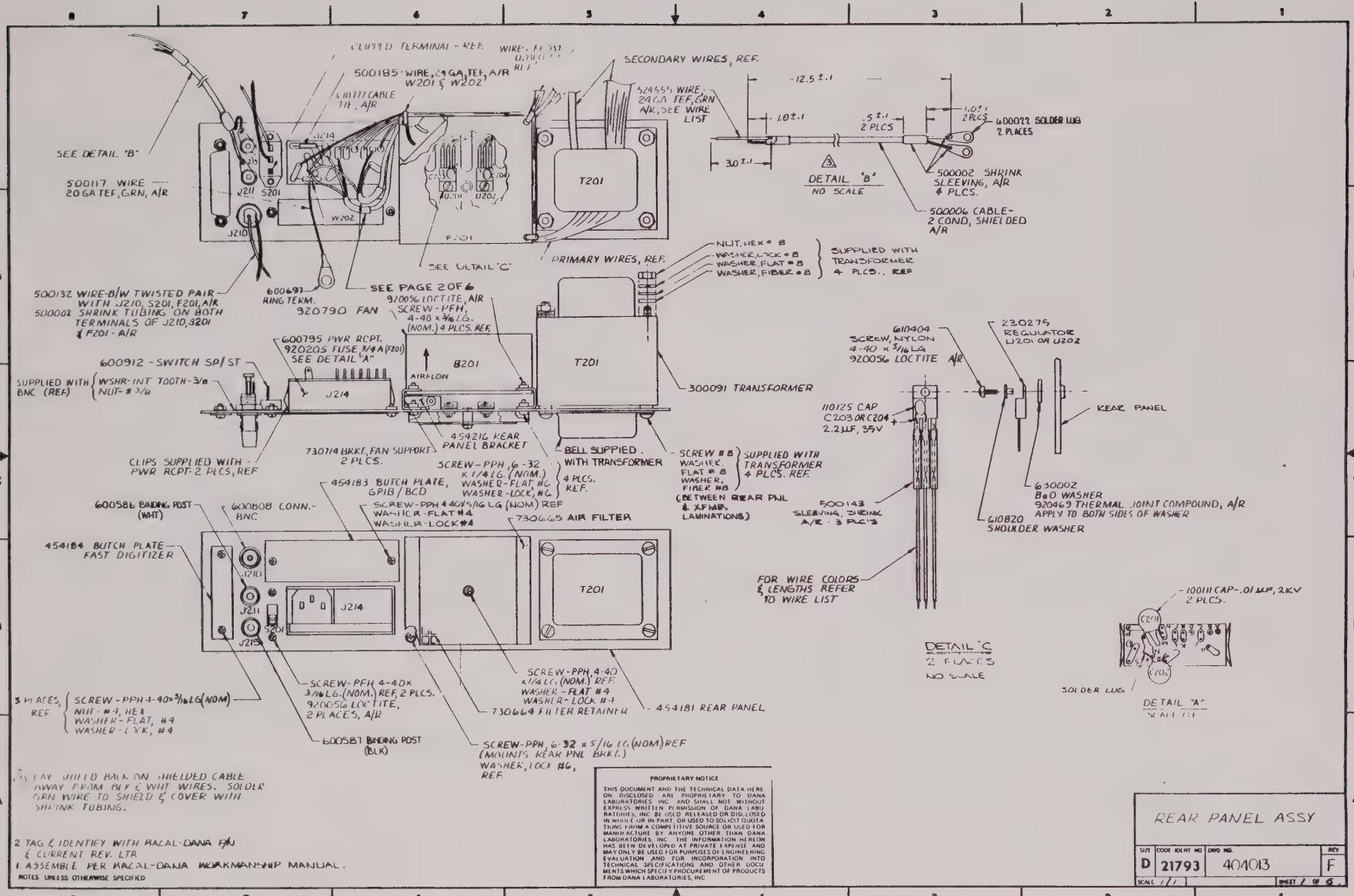
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CHASSIS ASSEMBLY

SIZE	CODE IDENT NO	DWG NO.	REV
D	21793	404009	J

SCALE - NONE SHEET 2 OF 6


SEE DETAIL "B"
500117 WIRE — 20 GA TEF, GRN, A/R
500185 - WIRE, 24 GA TEF, A/R W201 & W202
610111 CABLE TIE, A/R
SECONDARY WIRES, REF.
524551 WIRE, 24GA TEF, GRN A/R, SEE WIRE LIST
12.5 ±.1
1.0 ±.1
.5 ±.1 2 PLCS
1.0 ±.1 2 PLCS
600022 SOLDER LUG 2 PLACES
30 ±.1
DETAIL "B" NO SCALE
500002 SHRINK SLEEVING, A/R 4 PLCS.
500006 CABLE - 2 COND, SHIELDED A/R
T201
F201
SEE DETAIL "C"
PRIMARY WIRES, REF.
NUT, HEX #8
WASHER, LOCK #8
WASHER, FLAT #8
WASHER, FIBER #8
SUPPLIED WITH TRANSFORMER 4 PLCS., REF
500132 WIRE-B/W TWISTED PAIR WITH J210, S201, F201, A/R
500002 SHRINK TUBING ON BOTH TERMINALS OF J210, S201 & F201 - A/R
600697 RING TERM.
920790 FAN
SEE PAGE 2 OF 6
920056 LOCTITE, AIR
SCREW-PFH, 4-40 x 3/16 LG. (NOM.) 4 PLCS. REF.
600795 PWR RCPT. 920205 FUSE 3/4A (F201) SEE DETAIL "A"
600912 - SWITCH SP/ST
SUPPLIED WITH BNC (REF)
WSHR-INT TOOTH-3/8
NUT-#3/8
J214
B201
AIRFLOW
300091 TRANSFORMER
610404 SCREW, NYLON 4-40 x 3/16 LG 920056 LOCTITE A/R
230275 REGULATOR U201 OR U202
REAR PANEL
110125 CAP C203 OR C204 2.2 MF, 35V
630002 B&O WASHER 920469 THERMAL JOINT COMPOUND, A/R APPLY TO BOTH SIDES OF WASHER
610820 SHOULDER WASHER
CLIPS SUPPLIED WITH PWR RCPT-2 PLCS, REF
730714 BRKT, FAN SUPPORT 2 PLCS.
454216 REAR PANEL BRACKET
BELL SUPPLIED WITH TRANSFORMER
SCREW-PPH, 6-32 x 1/4 LG. (NOM.) WASHER-FLAT, #6 WASHER-LOCK, #6 4 PLCS. REF.
SCREW #8 WASHER, FLAT #8 WASHER, FIBER #8 SUPPLIED WITH TRANSFORMER 4 PLCS. REF. (BETWEEN REAR PNL & XFMR. LAMINATIONS)
500143 SLEEVING, SHRINK A/R - 3 PLCS
FOR WIRE COLORS & LENGTHS REFER TO WIRE LIST
DETAIL "C" 2 PLACES NO SCALE
100111 CAP-.01 MF, 2KV 2 PLCS.
SOLDER LUG
DETAIL "A" SCALE 1:1
600581 BINDING POST (WHT)
600808 CONN.-BNC
454183 BUTCH PLATE, GPIB/BCD
SCREW-PPH 4-40 x 5/16 LG (NOM) REF WASHER-FLAT #4 WASHER-LOCK #4
730665 AIR FILTER
454184 BUTCH PLATE - FAST DIGITIZER
J210
J211
J215
S201
J214
T201
3 PLACES, REF SCREW-PPH 4-40 x 3/16 LG (NOM) NUT-#4, HEX WASHER-FLAT, #4 WASHER-LOCK, #4
SCREW-PFH 4-40 x 3/16 LG. (NOM.) REF, 2 PLCS. 920056 LOCTITE, 2 PLACES, A/R
600581 BINDING POST (BLK)
SCREW-PPH, 4-40 x 1/4 LG. (NOM.) REF WASHER - FLAT #4 WASHER - LOCK #4
730664 FILTER RETAINER
454181 REAR PANEL
SCREW-PPH, 6-32 x 5/16 LG. (NOM) REF (MOUNTS REAR PNL BRKT.) WASHER, LOCK #6, REF.

(1) LAY SHIELD BACK ON SHIELDED CABLE AWAY FROM BLK & WHT WIRES. SOLDER GRN WIRE TO SHIELD & COVER WITH SHRINK TUBING.

2 TAG & IDENTIFY WITH MACAL-DANA P/N & CURRENT REV. LTR

1. ASSEMBLE PER MACAL-DANA WORKMANSHIP MANUAL.

NOTES UNLESS OTHERWISE SPECIFIED

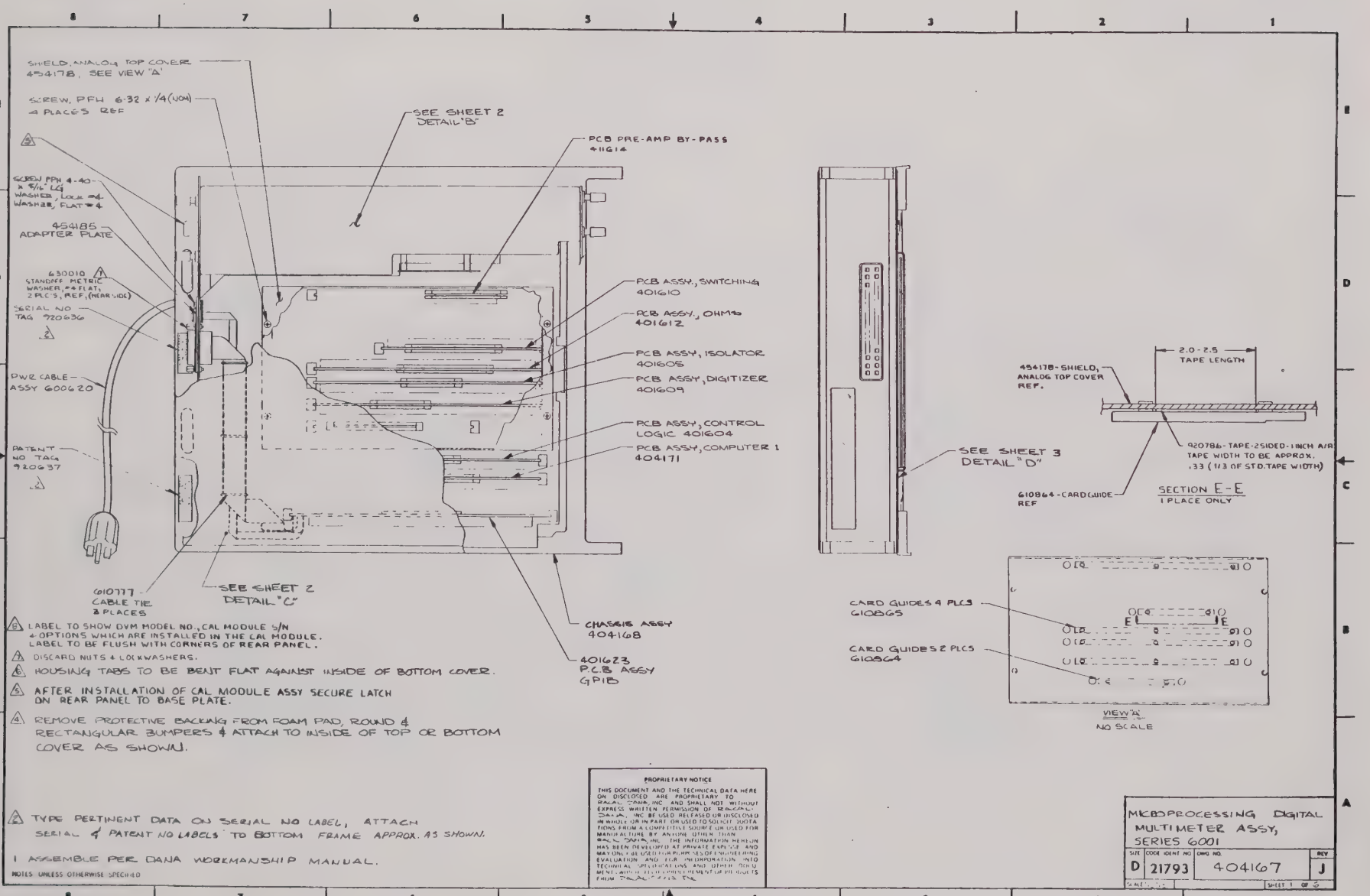
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REAR PANEL ASSY

SIZE	CODE IDENT NO	DWG NO.	REV
D	21793	404013	F

SCALE 1/1 SHEET 1 OF 6


SHIELD, ANALOG TOP COVER 454178, SEE VIEW "A"
SCREW, PFH 6-32 x 1/4 (NOM) 4 PLACES REF
SEE SHEET 2 DETAIL "B"
PCB PRE-AMP BY-PASS 411614
SCREW PPH 4-40 x 5/16 LG
WASHER, LOCK #4
WASHER, FLAT #4
454185 ADAPTER PLATE
630010 STANDOFF METRIC WASHER, #4 FLAT, 2 PLCS, REF, (NEAR SIDE)
SERIAL NO TAG 920636
PCB ASSY, SWITCHING 401610
PCB ASSY., OHMS 401612
PCB ASSY, ISOLATOR 401605
PCB ASSY, DIGITIZER 401609
PCB ASSY, CONTROL LOGIC 401604
PCB ASSY, COMPUTER 1 404171
PWR CABLE ASSY 600620
PATENT NO TAG 920637
610777 CABLE TIE 3 PLACES
SEE SHEET 2 DETAIL "C"
CHASSIS ASSY 404168
401623 P.C.B ASSY GPIB
SEE SHEET 3 DETAIL "D"
454178 - SHIELD, ANALOG TOP COVER REF.
2.0 - 2.5 TAPE LENGTH
920786 - TAPE - 2SIDED - 1 INCH A/R TAPE WIDTH TO BE APPROX. .33 (1/3 OF STD. TAPE WIDTH)
610864 - CARD GUIDE REF
SECTION E-E 1 PLACE ONLY
CARD GUIDES 4 PLCS 610865
CARD GUIDES 2 PLCS 610864
VIEW "A" NO SCALE

6 LABEL TO SHOW DVM MODEL NO., CAL MODULE S/N & OPTIONS WHICH ARE INSTALLED IN THE CAL MODULE. LABEL TO BE FLUSH WITH CORNERS OF REAR PANEL.

7 DISCARD NUTS & LOCKWASHERS.

8 HOUSING TABS TO BE BENT FLAT AGAINST INSIDE OF BOTTOM COVER.

9 AFTER INSTALLATION OF CAL MODULE ASSY SECURE LATCH ON REAR PANEL TO BASE PLATE.

4 REMOVE PROTECTIVE BACKING FROM FOAM PAD, ROUND & RECTANGULAR BUMPERS & ATTACH TO INSIDE OF TOP OR BOTTOM COVER AS SHOWN.

2 TYPE PERTINENT DATA ON SERIAL NO LABEL, ATTACH SERIAL & PATENT NO LABELS TO BOTTOM FRAME APPROX. AS SHOWN.

1 ASSEMBLE PER DANA WORKMANSHIP MANUAL.

NOTES UNLESS OTHERWISE SPECIFIED

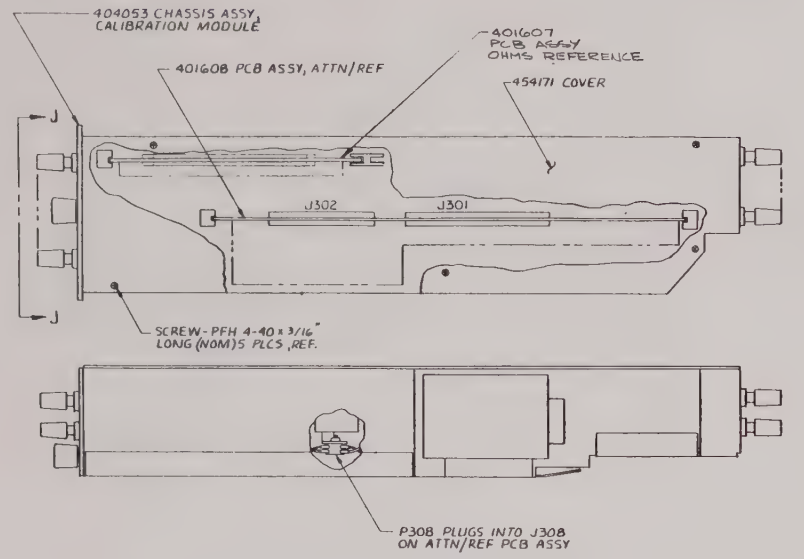
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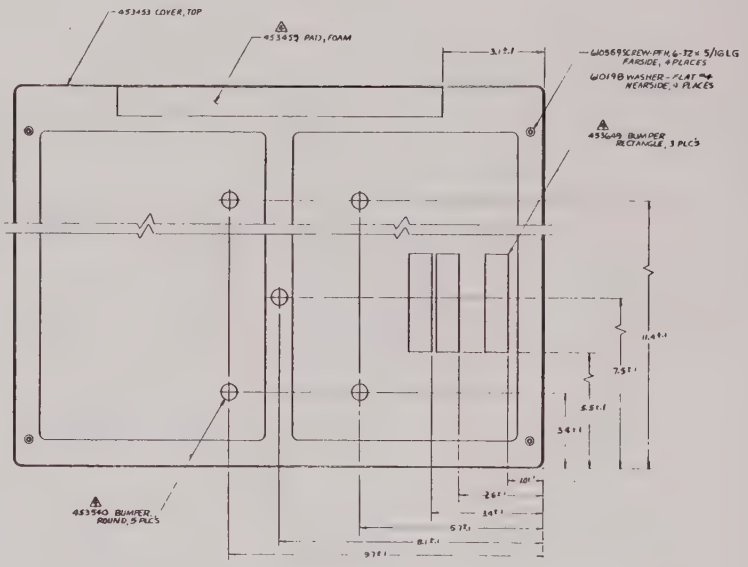
MICROPROCESSING DIGITAL MULTIMETER ASSY, SERIES 6001

SIZE	CODE IDENT NO	DWG NO.	REV
D	21793	404167	J

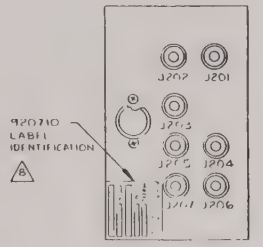
SCALE — SHEET 1 OF 5



DETAIL "B"



DETAIL "C"



VIEW J
SCALE NONE

PROPRIETARY NOTICE

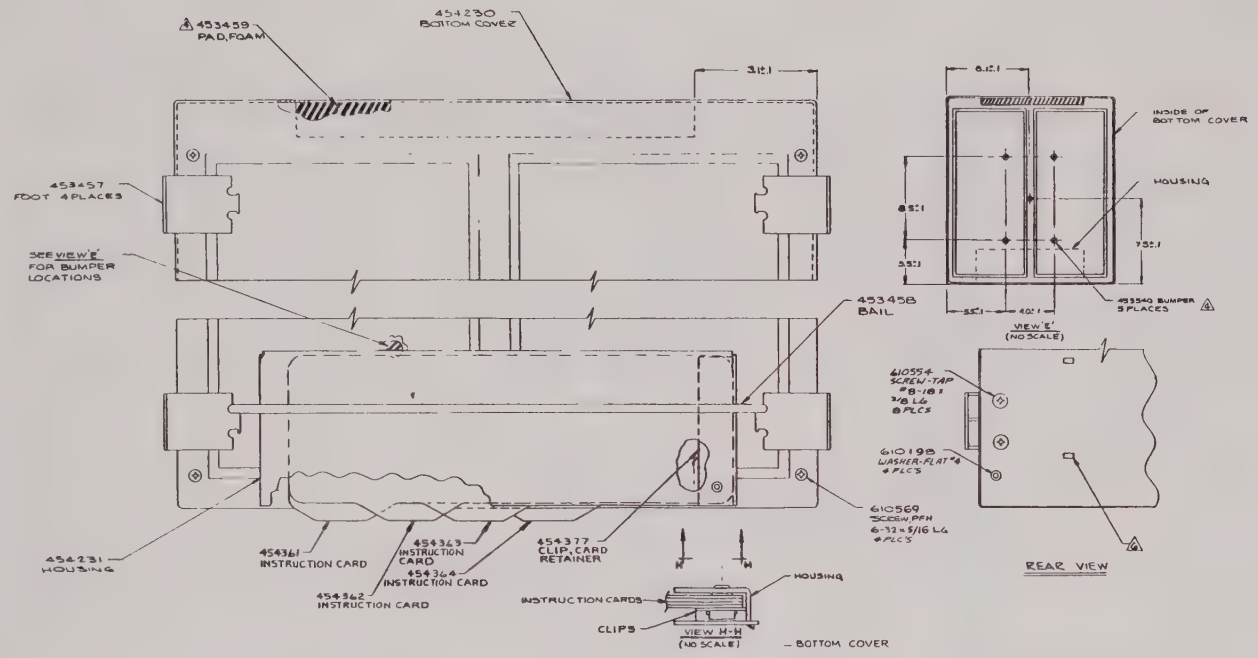
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NOTES: UNLESS OTHERWISE SPECIFIED

MICROPROCESSING DIGITAL MULTIMETER ASSY, SERIES 6001

SIZE	CODE IDENT NO	DWG NO	REV
D	21793	404607	J

SCALE: 1 | SHEET 2 OF 6



DETAIL "D"

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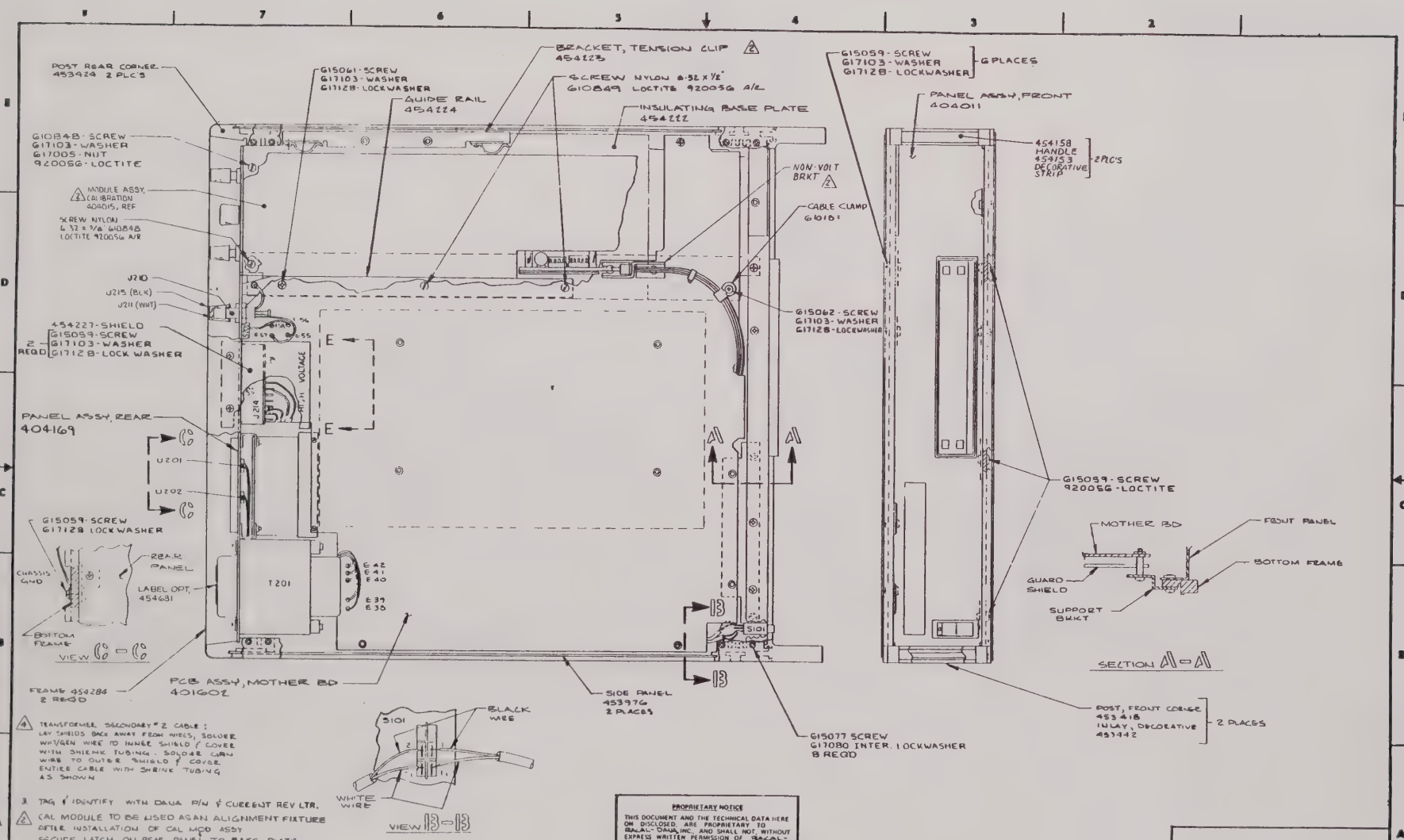
NOTES UNLESS OTHERWISE SPECIFIED

MICROPROCESSING DIGITAL MULTIMETER ASSY SERIES 6001

SIZE	CODE IDENT NO	DWG NO	REV
D	21793	4041167	J

SCALE 1 = 1 SHEET 5 OF 5

7-9a



4. TRANSFORMER SECONDARY #2 CABLE: LAY SHIELDS BACK AWAY FROM WIRES, SOLDER WHT/GRN WIRE TO INNER SHIELD & COVER WITH SHRINK TUBING. SOLDER GRN WIRE TO OUTER SHIELD & COVER ENTIRE CABLE WITH SHRINK TUBING AS SHOWN

3. TAG & IDENTIFY WITH DANA P/N & CURRENT REV LTR.

2. CAL MODULE TO BE USED AGAIN ALIGNMENT FIXTURE AFTER INSTALLATION OF CAL MOD ASSY. SECURE LATCH ON REAR PANEL TO BASE PLATE, ADJUST NON-VOLT BRKT ON MOTHER BD, MOVE TENSION CLIP BRKT TOWARD CAL MOD AND TIGHTEN TO BOTTOM FOLLIE.

1. ASSEMBLE PER RACAL-DANA WORKMANSHIP MANUAL.

NOTES UNLESS OTHERWISE SPECIFIED

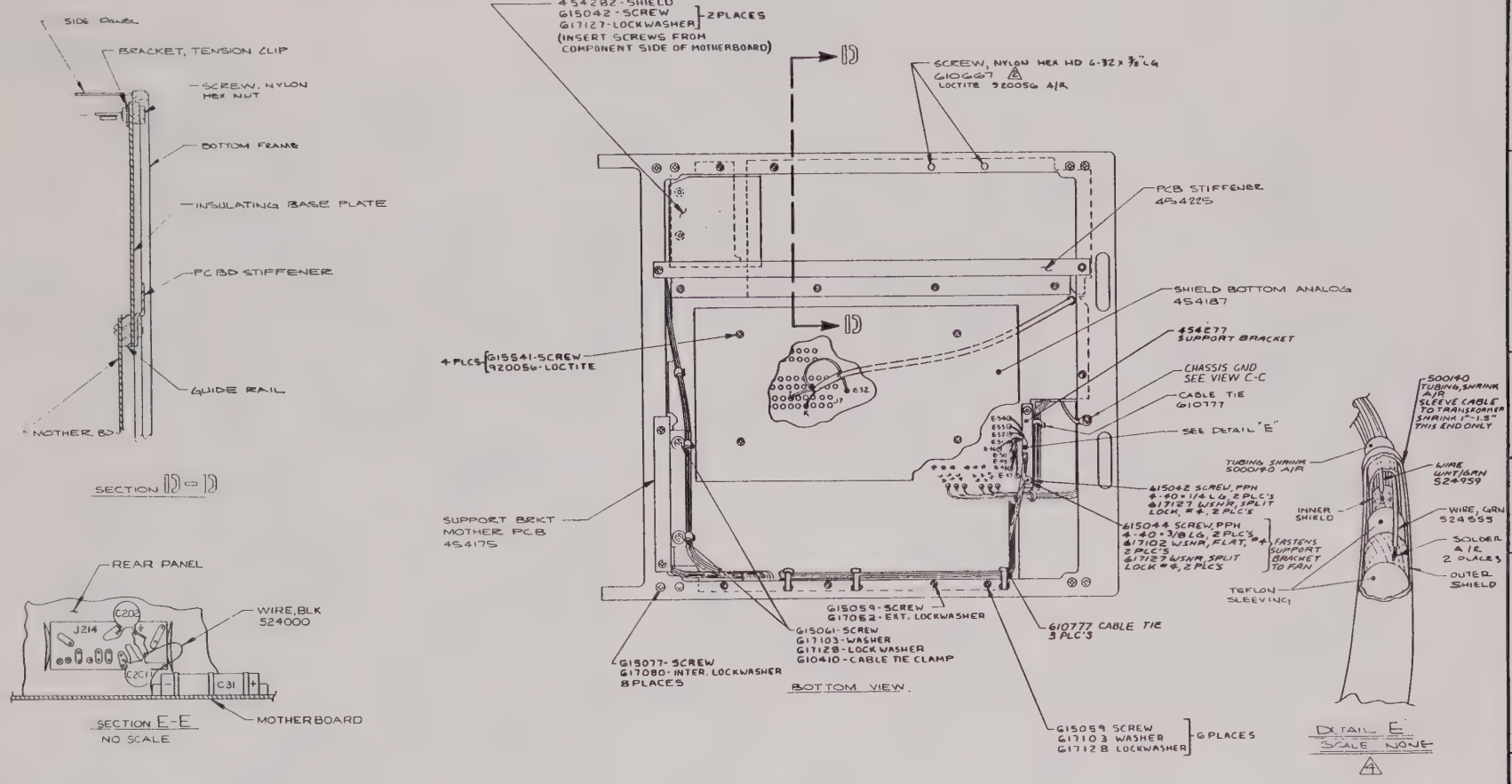
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CHASSIS ASSEMBLY

SIZE	CODE IDENT NO	DWG NO	REV
D	21793	404168	J

SCALE NONE SHEET 1 OF 2



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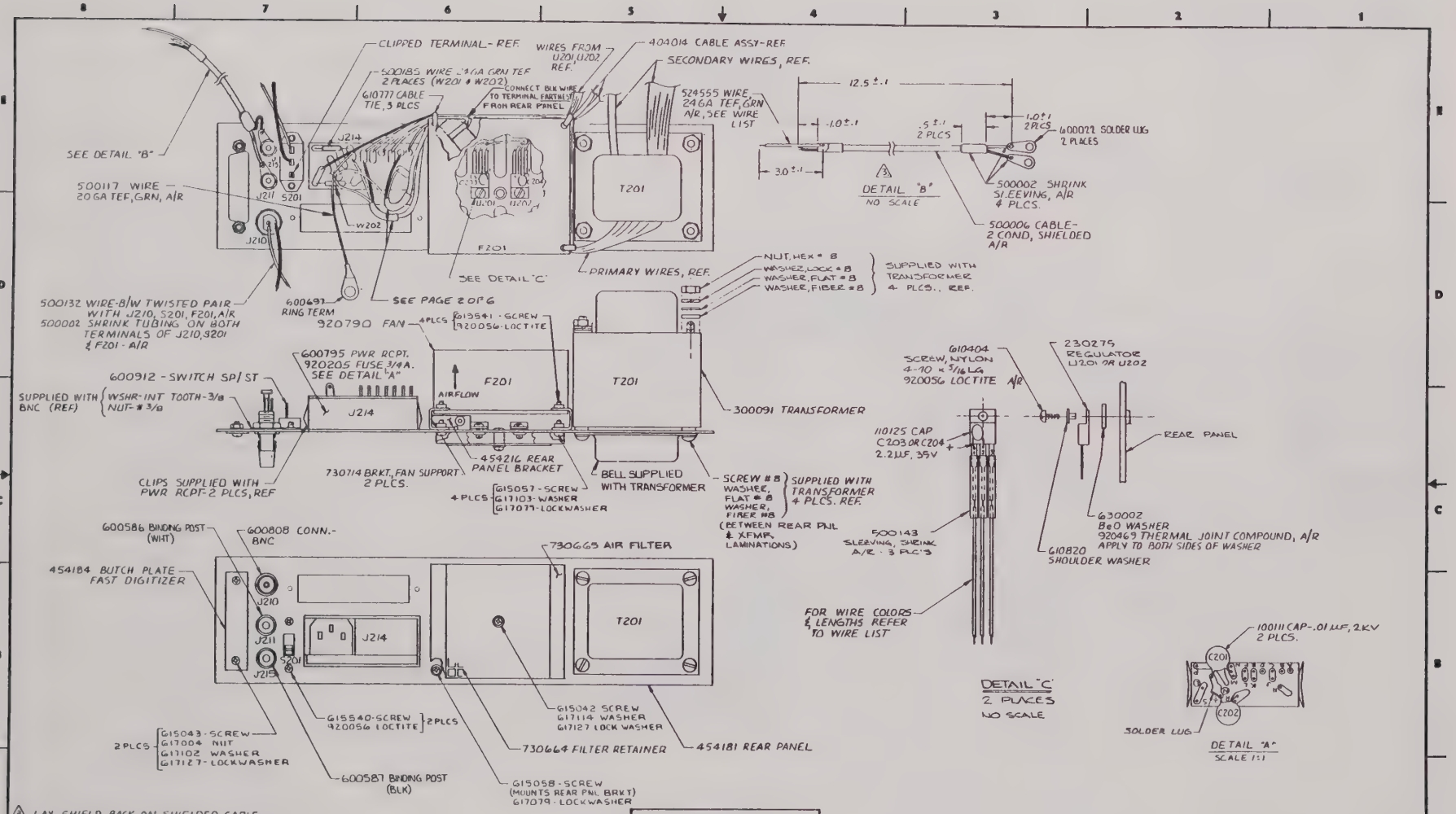
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NOTES UNLESS OTHERWISE SPECIFIED

CHASSIS ASSEMBLY

SIZE	CODE IDENT NO	DWG NO	REV
D	21793	404168	J

SCALE (-) SHEET 2 OF 7



3. LAY SHIELD BACK ON SHIELDED CABLE AWAY FROM BLK & WHT WIRES. SOLDER GRN WIRE TO SHIELD & COVER WITH SHRINK TUBING.

2. TAG & IDENTIFY WITH RACAL-DANA P/N & CURRENT REV. LTR
1. ASSEMBLE PER RACAL-DANA WORKMANSHIP MANUAL.

NOTES: UNLESS OTHERWISE SPECIFIED

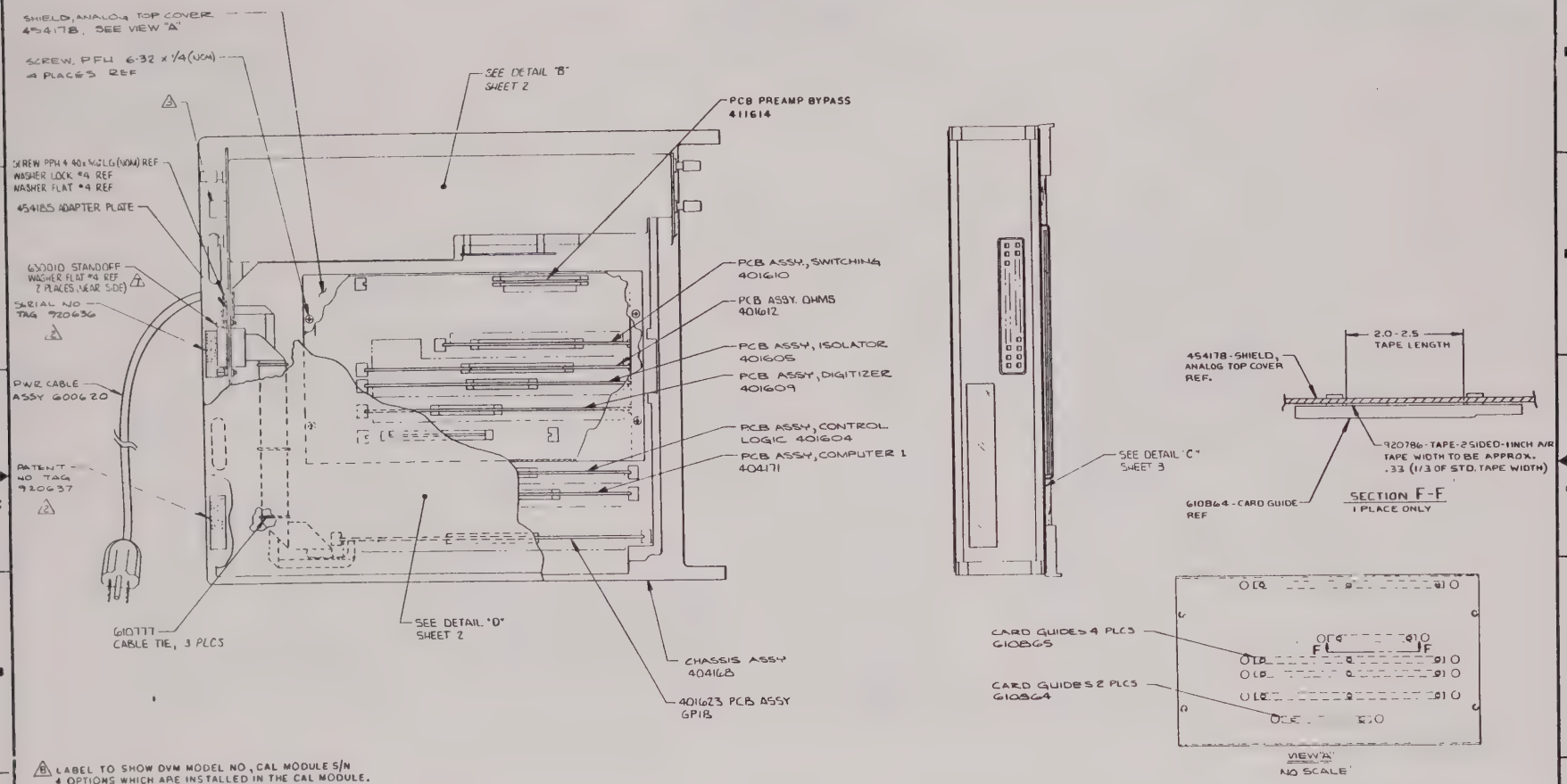
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REAR PANEL ASSY

SIZE	CODE IDENT NO.	DWG NO.	REV
D	21793	404169	E

SCALE 1/1 SHEET 1 OF 2


SHIELD, ANALOG TOP COVER 454178, SEE VIEW "A"
SCREW, PFH 6-32 x 1/4 (NOM) 4 PLACES REF
SEE DETAIL "B" SHEET 2
PCB PREAMP BYPASS 411614
SCREW PPH 4-40 x 3/16 LG (NOM) REF
WASHER LOCK #4 REF
WASHER FLAT #4 REF
454185 ADAPTER PLATE
630010 STANDOFF
WASHER FLAT #4 REF
2 PLACES (REAR SIDE)
SERIAL NO TAG 920636
PCB ASSY, SWITCHING 401610
PCB ASSY. OHMS 401612
PCB ASSY, ISOLATOR 401605
PCB ASSY, DIGITIZER 401609
PWR CABLE ASSY 600620
PCB ASSY, CONTROL LOGIC 401604
PCB ASSY, COMPUTER I 401171
PATENT NO TAG 920637
610777 CABLE TIE, 3 PLCS
SEE DETAIL "D" SHEET 2
CHASSIS ASSY 404168
401623 PCB ASSY GPIB
SEE DETAIL "C" SHEET 3
454178 - SHIELD, ANALOG TOP COVER REF.
2.0 - 2.5 TAPE LENGTH
920786 - TAPE-2 SIDED-1 INCH A/R TAPE WIDTH TO BE APPROX. .33 (1/3 OF STD. TAPE WIDTH)
610864 - CARD GUIDE REF
SECTION F-F
1 PLACE ONLY
CARD GUIDES 4 PLCS 610865
CARD GUIDES 2 PLCS 610864
VIEW "A"
NO SCALE

⚠8 LABEL TO SHOW DVM MODEL NO., CAL MODULE S/N & OPTIONS WHICH ARE INSTALLED IN THE CAL MODULE. LABEL TO BE FLUSH WITH CORNERS OF REAR PANEL.

⚠7 DISCARD NUTS AND LOCK WASHERS SUPPLIED WITH CONNECTOR.

⚠6 HOUSING TABS TO BE BENT FLAT AGAINST INSIDE OF BOTTOM COVER

⚠5 REMOVE PROTECTIVE BACKING FROM THE FOAM PADS AND THE ROUND AND RECTANGULAR BUMPERS AND ATTACH TO INSIDE OF TOP COVER, SEE DETAIL "D"

⚠4 AFTER INSTALLATION OF CAL MODULE ASSEMBLY SECURE LATCH ON REAR PANEL TO CASE PLATE

⚠3 TYPE PERTINENT DATA ON SERIAL NUMBER LABEL, ATTACH SERIAL AND PATENT NUMBER LABELS TO BOTTOM FRAME APPROX AS SHOWN.

1 ASSEMBLE PER DANA WORKMANSHIP MANUAL.

NOTES: UNLESS OTHERWISE SPECIFIED

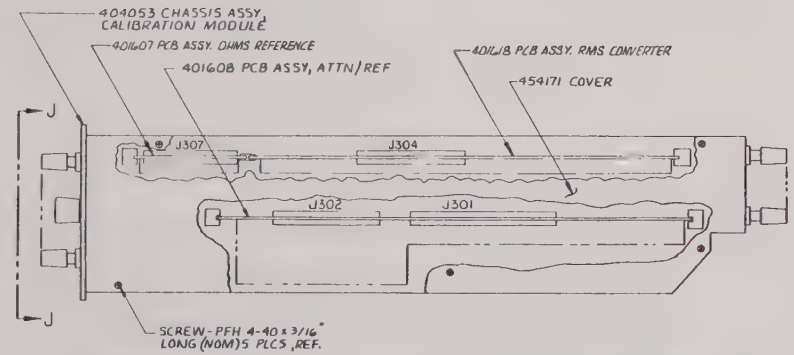
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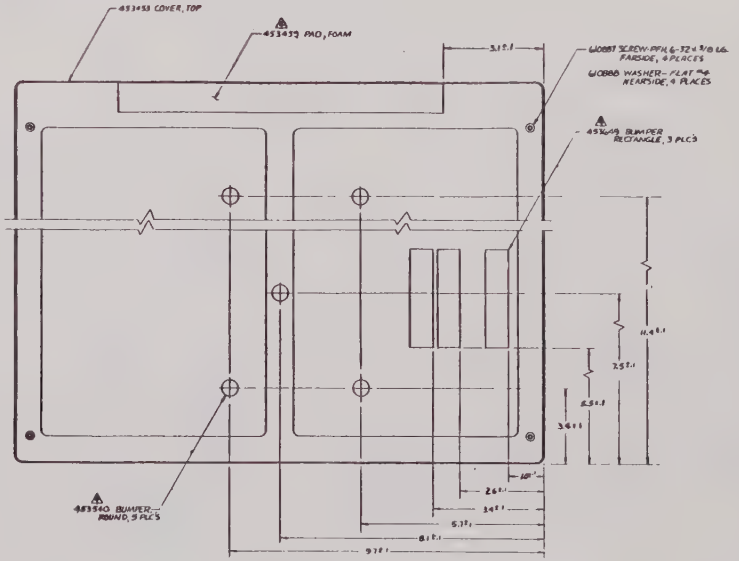
MICROPROCESSING DIGITAL MULTIMETER ASSY., 6002

SIZE	CODE IDENT NO	DWG NO.	REV
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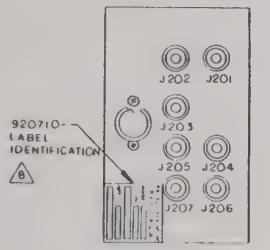
SCALE: NONE | SHEET 1 OF 6



DETAIL B
SCALE NONE


453453 COVER, TOP
453439 PAD, FOAM
WOBBT SCREW-PFH 6-32 x 3/8 LG FAIRSIDE, 4 PLACES
WOBBB WASHER-FLAT FOR NEARSIDE, 4 PLACES
453449 BUMPER RECTANGLE, 3 PLCS
453440 BUMPER-ROUND, 3 PLCS

DETAIL D
SCALE NONE



VIEW J
SCALE NONE

NOTES UNLESS OTHERWISE SPECIFIED

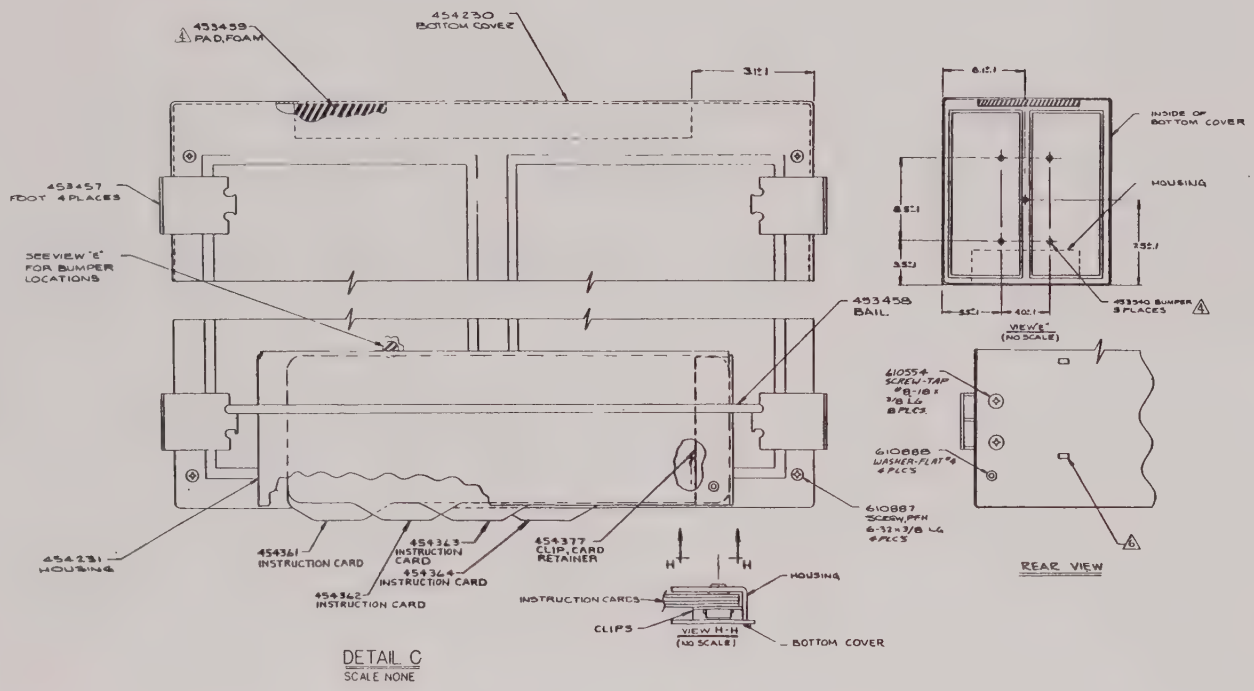
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MICROPROCESSING DIGITAL MULTIMETER ASSY., 6002

SIZE	CODE IDENT NO	DWG NO	REV
D	21793	404166	F

SCALE NONE | SHEET 2 OF 6



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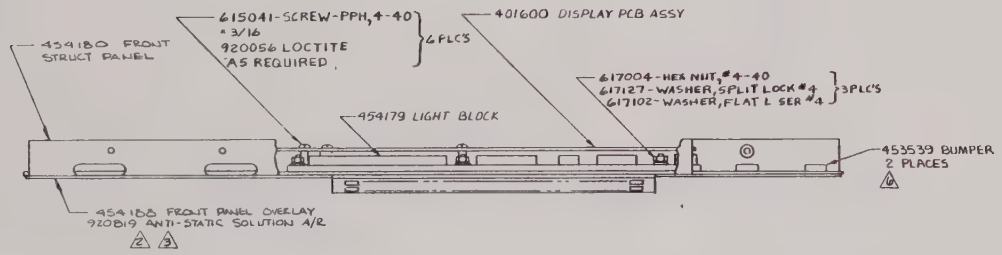
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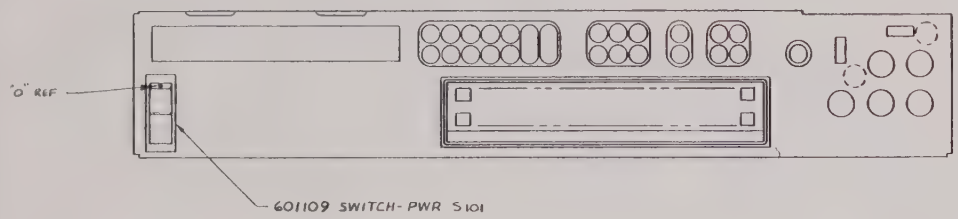
MICROPROCESSING DIGITAL MULTIMETER ASSY., 6002

SIZE	CODE IDENT NO	DWG NO.	REV
D	21793	404166	F

SCALE 1/1 | SHEET 3 OF 6

7-14a





6. POSITION APPROX WHERE SHOWN.
5. TAG & IDENTIFY WITH DANA P/N & CURRENT REV. LTR.
4. COVER FOR PROTECTION DURING STORAGE & SHIPMENT.
3. APPLY ANTI-STATIC SOLUTION TO FRONT SIDE OF OVERLAY & WIPE CLEAN AFTER REMOVAL OF PROTECTIVE COVER & WHEN ASSEMBLY IS COMPLETE.
2. REMOVE PROTECTIVE PEEL-OFF COVER FROM OVERLAY & EXERCISE CAUTION DURING ASSEMBLY TO PREVENT DAMAGE TO FRONT SURFACE. ASSEMBLY TO BE FREE OF AIR BUBBLES.
1. ASSEMBLE PER DANA WORKMANSHIP MANUAL.

NOTES UNLESS OTHERWISE SPECIFIED

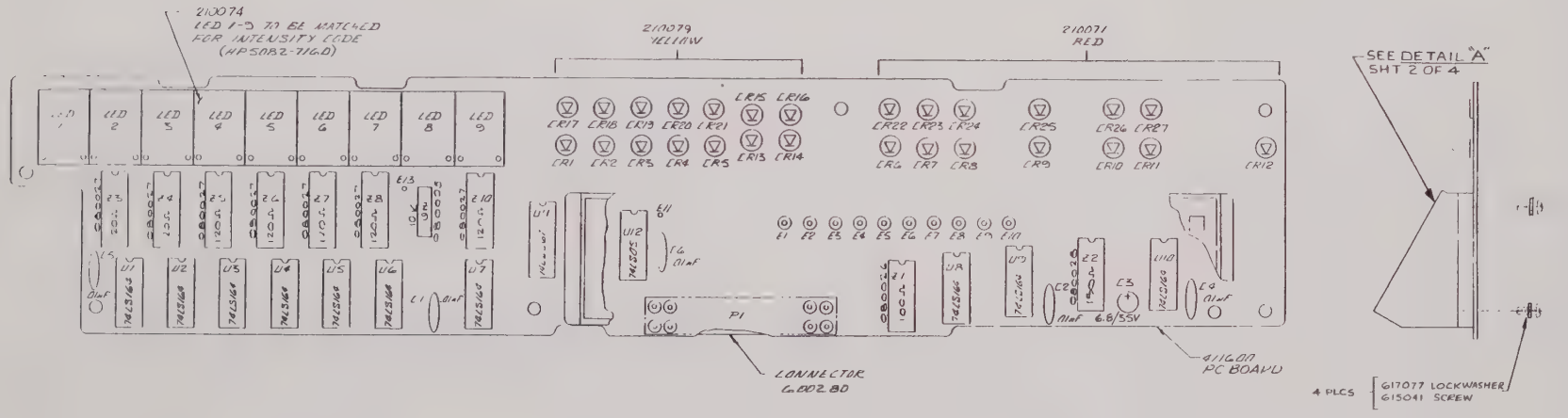
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FRONT PANEL ASSY

SIZE	CODE IDENT NO	DWG NO.	REV
D	21793	404011	E

SCALE 1:1 SHEET 1 OF 2



2 ASSY FOLLOWED BY LINEDURES TO CONFORM TO DANA WIRE MARKING STANDARDS
1 REF SCHEMATIC 6116.01

NOTES UNLESS OTHERWISE SPECIFIED

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DANA DANA LABORATORIES INC. IRVINE, CALIFORNIA

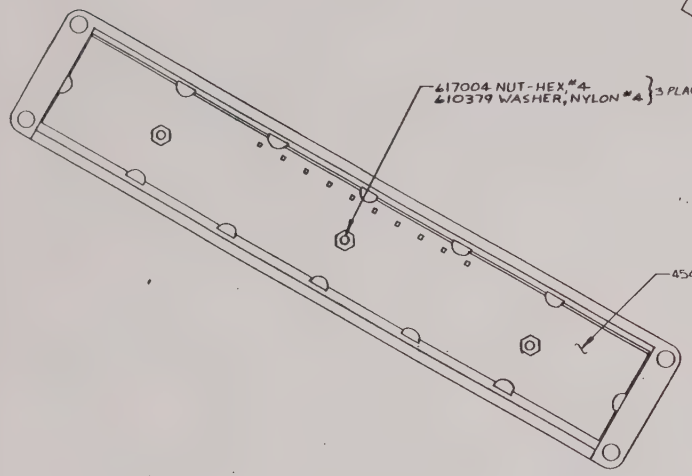
ASSY
DISPLAY BOARD

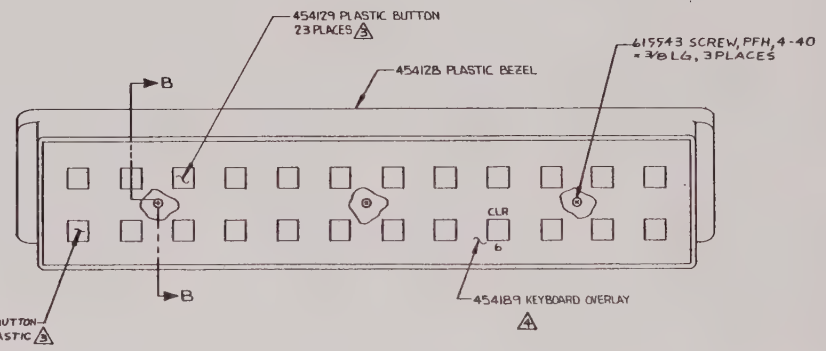
SIZE	CODE IDENT NO	DWG NO	REV
D	21793	6116.01	J

SCALE — SHEET 1 OF 4



SECTION B - B
SCALE: 4/1





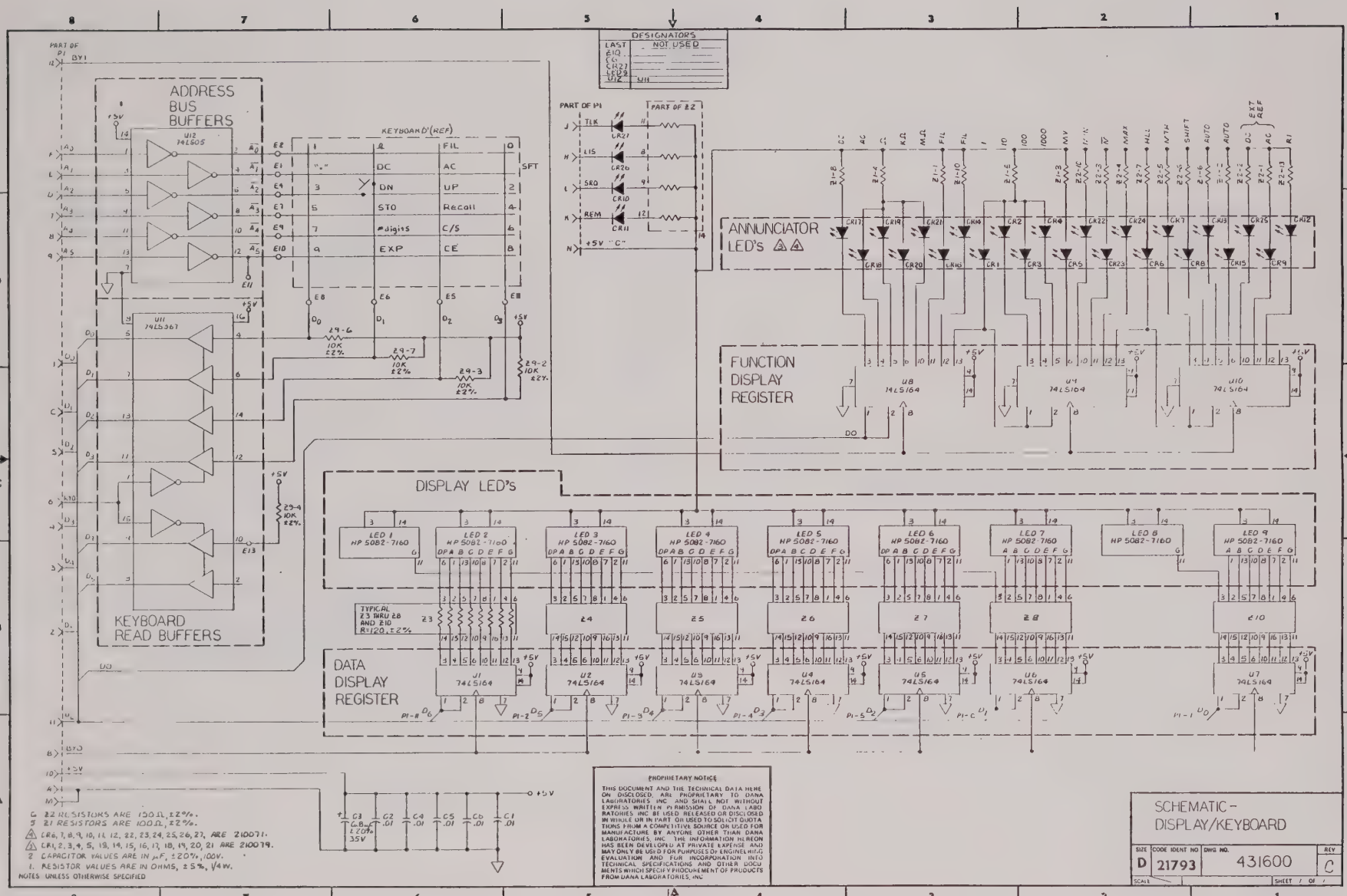
DETAIL "A"

5. TAG & IDENTIFY WITH DANA P/N & CURRENT REV. LTR.
4 INSTALL OVERLAY ON BEZEL USING TOOL P/N 990096
3 BUTTONS SHOULD MOVE FREELY IN BEZEL AFTER INSTALLATION.

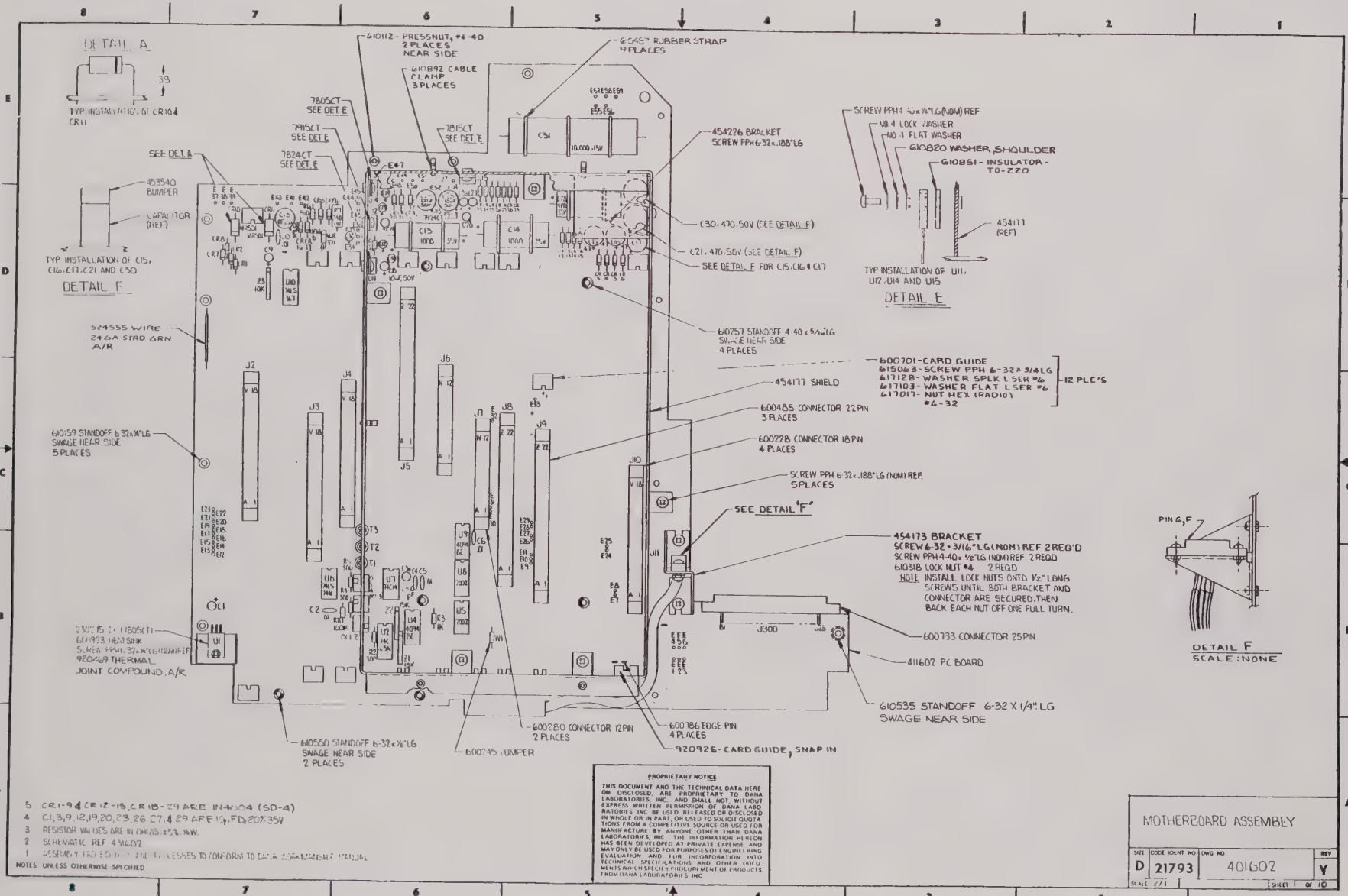
NOTES UNLESS OTHERWISE SPECIFIED

SIZE	CODE IDENT NO	DWG NO	REV
D	21793	401600	J
SCALE 2/1		SHEET 2 OF 4	

7-164


DESIGNATORS
LAST NOT USED
ADDRESS BUS BUFFERS
KEYBOARD READ BUFFERS
KEYBOARD (REF)
ANNUNCIATOR LED's
FUNCTION DISPLAY REGISTER
DISPLAY LED's
DATA DISPLAY REGISTER
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SCHEMATIC – DISPLAY/KEYBOARD
SIZE D
CODE IDENT NO 21793
DWG NO. 431600
REV C
SCALE
SHEET 1 OF 1

NOTES UNLESS OTHERWISE SPECIFIED
1. RESISTOR VALUES ARE IN OHMS, ±5%, ¼W.
2 CAPACITOR VALUES ARE IN μF, ±20%, 100V.
△ CR1, 2, 3, 4, 5, 13, 14, 15, 16, 17, 18, 19, 20, 21 ARE 210079.
△ CR6, 7, 8, 9, 10, 11, 12, 22, 23, 24, 25, 26, 27, ARE 210071.
3 21 RESISTORS ARE 100Ω, ±2%.
6 22 RESISTORS ARE 150Ω, ±2%.


DETAIL A
.38
TYP INSTALLATION OF CR10 & CR11
610112 - PRESSNUT, #4-40 2 PLACES NEAR SIDE
6008?? RUBBER STRAP 4 PLACES
610892 CABLE CLAMP 3 PLACES
7805CT SEE DET E
7915CT SEE DET E
7815CT SEE DET E
7824CT SEE DET E
SEE DET A
454226 BRACKET SCREW PPH 6-32 x .188" LG
SCREW PPH 4-40 x 1/4" LG (NOM) REF
NO.4 LOCK WASHER
NO.4 FLAT WASHER
610820 WASHER, SHOULDER
610851 - INSULATOR - TO-220
454177 (REF)
TYP INSTALLATION OF U11, U12, U14 AND U15
DETAIL E
453540 BUMPER
CAPACITOR (REF)
TYP INSTALLATION OF C15, C16, C17, C21 AND C30
DETAIL F
(30, 470, 50V (SEE DETAIL F)
(21, 470, 50V (SEE DETAIL F)
SEE DETAIL F FOR C15, C16 & C17
610257 STANDOFF 4-40 x 5/16" LG SWAGE NEAR SIDE 4 PLACES
524555 WIRE 24GA STRD GRN A/R
600701-CARD GUIDE
615063-SCREW PPH 6-32 x 3/4 LG
617128-WASHER SPLK LSER #6
617103-WASHER FLAT LSER #6
617017-NUT HEX (RADIO) #6-32
12 PLC'S
454177 SHIELD
600485 CONNECTOR 22 PIN 3 PLACES
600228 CONNECTOR 18 PIN 4 PLACES
610159 STANDOFF 6-32 x 1/4" LG SWAGE NEAR SIDE 5 PLACES
SCREW PPH 6-32 x .188" LG (NOM) REF. 5 PLACES
SEE DETAIL 'F'
454173 BRACKET
SCREW 6-32 x 3/16" LG (NOM) REF 2 REQ'D
SCREW PPH 4-40 x 1/2" LG (NOM) REF 2 REQD
610318 LOCK NUT #4 2 REQD
NOTE INSTALL LOCK NUTS ONTO 1/2" LONG SCREWS UNTIL BOTH BRACKET AND CONNECTOR ARE SECURED. THEN BACK EACH NUT OFF ONE FULL TURN.
600733 CONNECTOR 25 PIN
411602 PC BOARD
610535 STANDOFF 6-32 X 1/4" LG SWAGE NEAR SIDE
600186 EDGE PIN 4 PLACES
600280 CONNECTOR 12 PIN 2 PLACES
600245 JUMPER
920925-CARD GUIDE, SNAP IN
610550 STANDOFF 6-32 x 7/16" LG SWAGE NEAR SIDE 2 PLACES
PIN G, F
DETAIL F
SCALE: NONE

5 CR1-9 & CR12-15, CR18-29 ARE IN4004 (SD-4)
4 C1, 3, 9, 12, 19, 20, 23, 26, 27, & 29 ARE 1G, FD, 20% 35V
3 RESISTOR VALUES ARE IN OHMS, ±5%, ¼W.
2 SCHEMATIC REF. 4 31602
1 ASSEMBLY TO BE BUILT IN ACCORDANCE WITH PROCESSES TO CONFORM TO DANA ASSEMBLY MANUAL

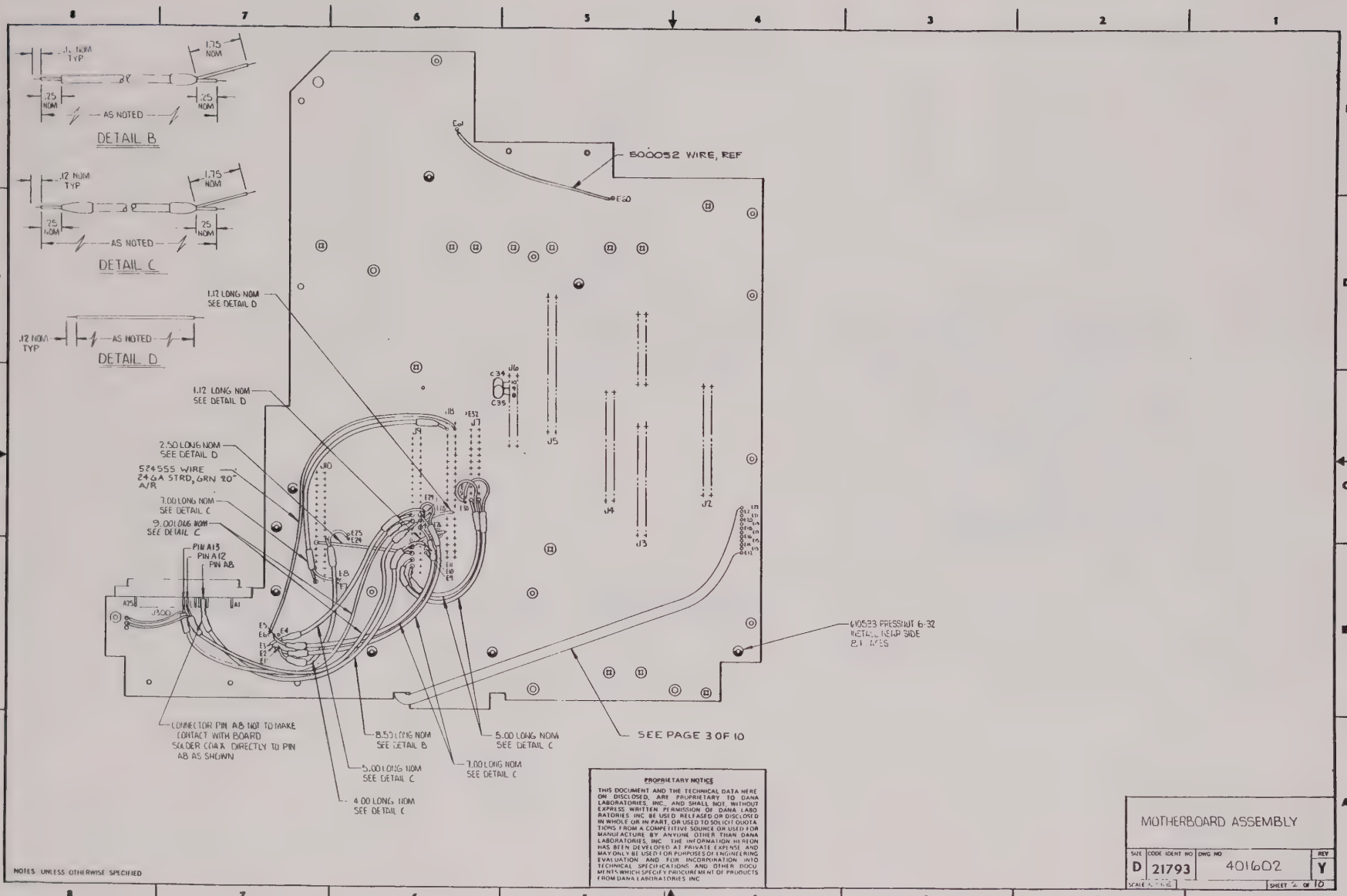
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MOTHERBOARD ASSEMBLY

SIZE	CODE IDENT NO	DWG NO	REV
D	21793	401602	Y

SCALE 2/1 SHEET 1 OF 10



NOTES: UNLESS OTHERWISE SPECIFIED

PROPRIETARY NOTICE

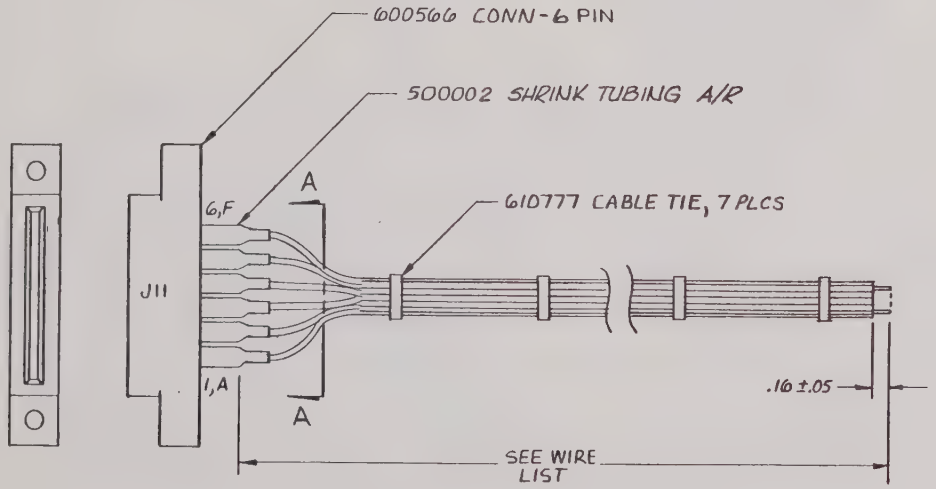
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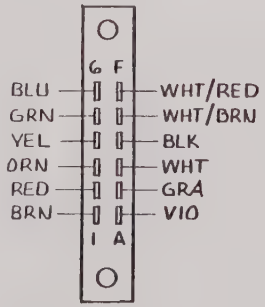
MOTHERBOARD ASSEMBLY

SIZE	CODE IDENT NO	DWG NO	REV
D	21793	401602	Y

SCALE NONE SHEET 2 OF 10

7-18a





VIEW A-A
SCALE 2/1

J11, PIN #	COLOR	PART NO.	LENGTH ± .15
F	WHT/RED	524929	18.5
E	WHT/BRN	524919	18.5
D	BLK	524000	18.5
C	WHT	524999	18.5
B	GRA	524888	18.5
A	VIO	524777	19.0
6	BLU	524666	19.0
5	GRN	524555	19.0
4	YEL	524444	19.0
3	ORN	524333	19.0
2	RED	524222	19.5
1	BRN	524111	19.5

WIRE LIST

PROPRIETARY NOTICE

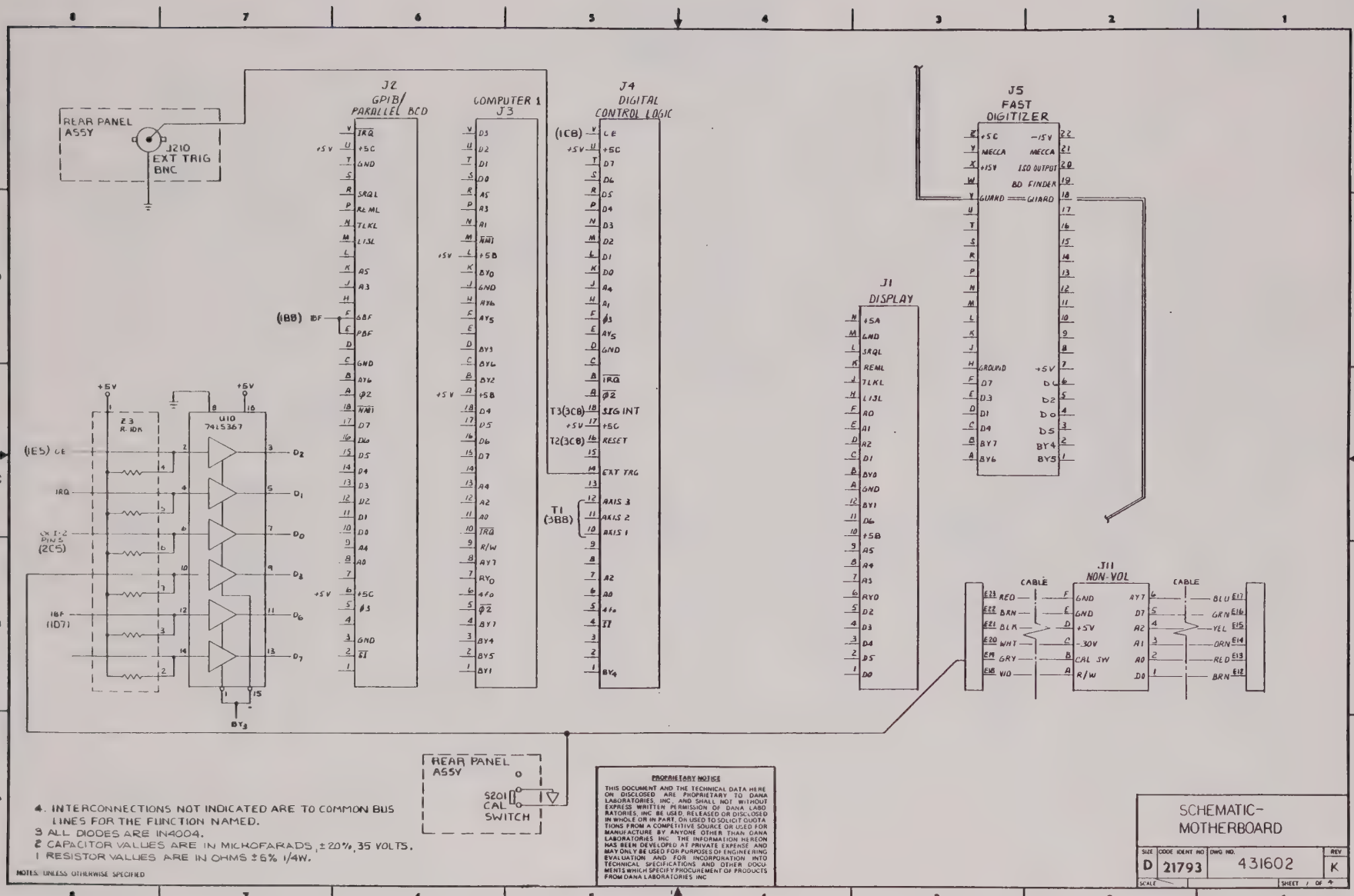
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NOTES: UNLESS OTHERWISE SPECIFIED

MOTHERBOARD ASSEMBLY

SIZE	CODE IDENT NO	DWG NO	REV
C	21793	401602	Y

SCALE



4. INTERCONNECTIONS NOT INDICATED ARE TO COMMON BUS LINES FOR THE FUNCTION NAMED.
3 ALL DIODES ARE IN4004.
2 CAPACITOR VALUES ARE IN MICROFARADS, ±20%, 35 VOLTS.
1 RESISTOR VALUES ARE IN OHMS ±5% 1/4W.

NOTES: UNLESS OTHERWISE SPECIFIED

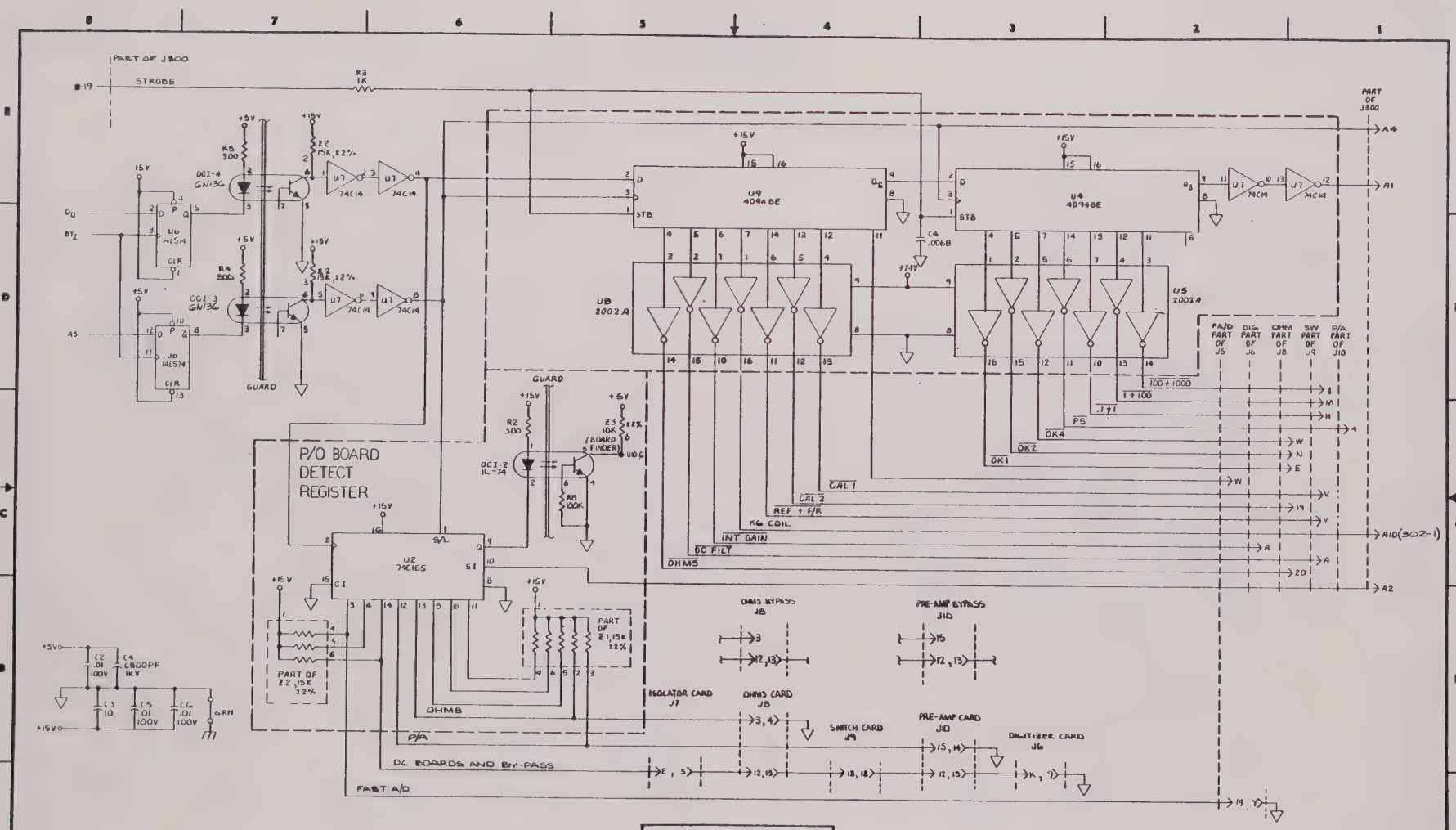
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SCHEMATIC- MOTHERBOARD

SIZE	CODE IDENT. NO	DWG NO.	REV
D	21793	431602	K

SCALE — SHEET 1 OF 4



PROPRIETARY NOTICE

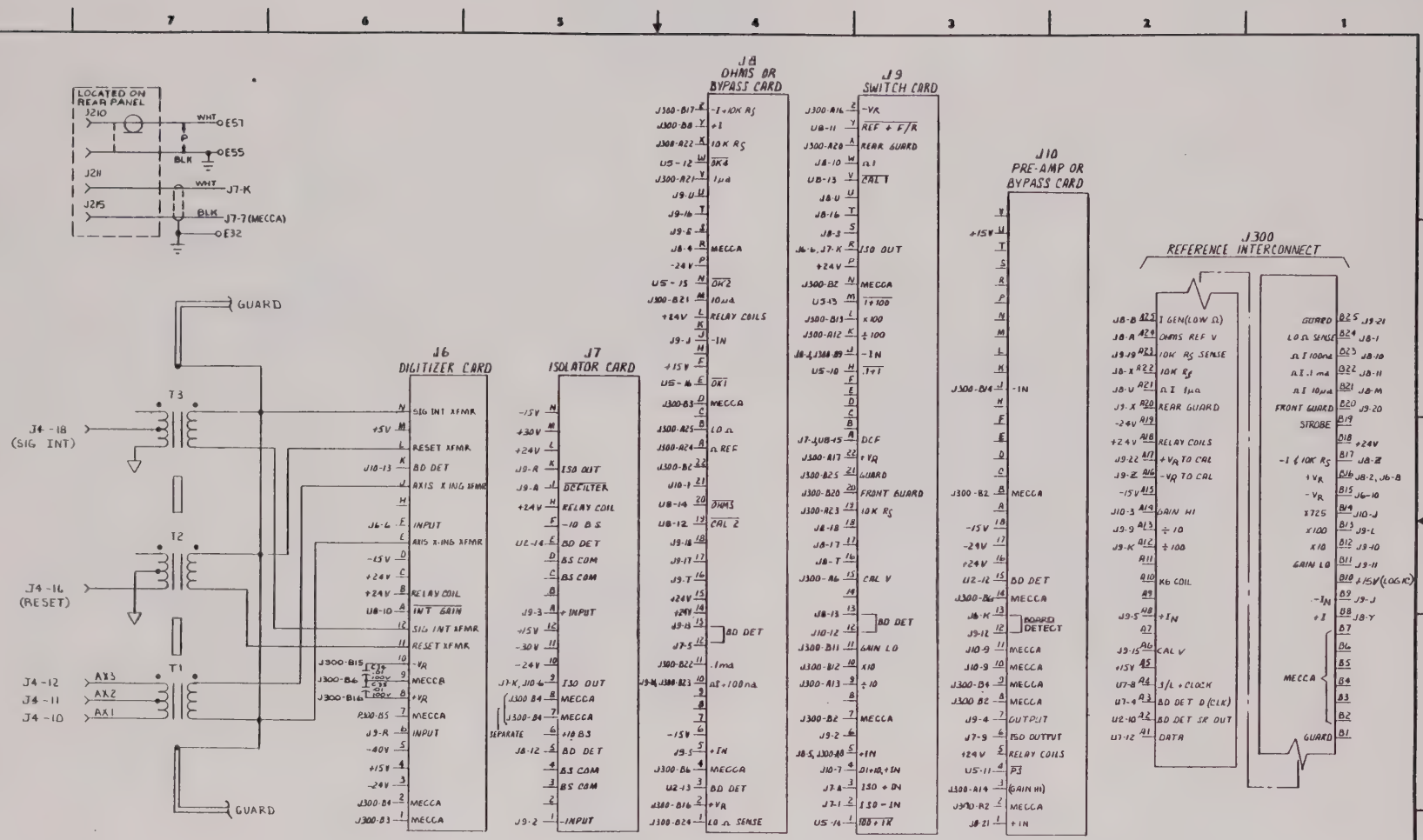
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NOTES: UNLESS OTHERWISE SPECIFIED

SCHEMATIC - MOTHERBOARD

SIZE	CODE IDENT NO	DWG NO.	REV
D	21793	431602	K

SCALE NONE SHEET 2 OF 4



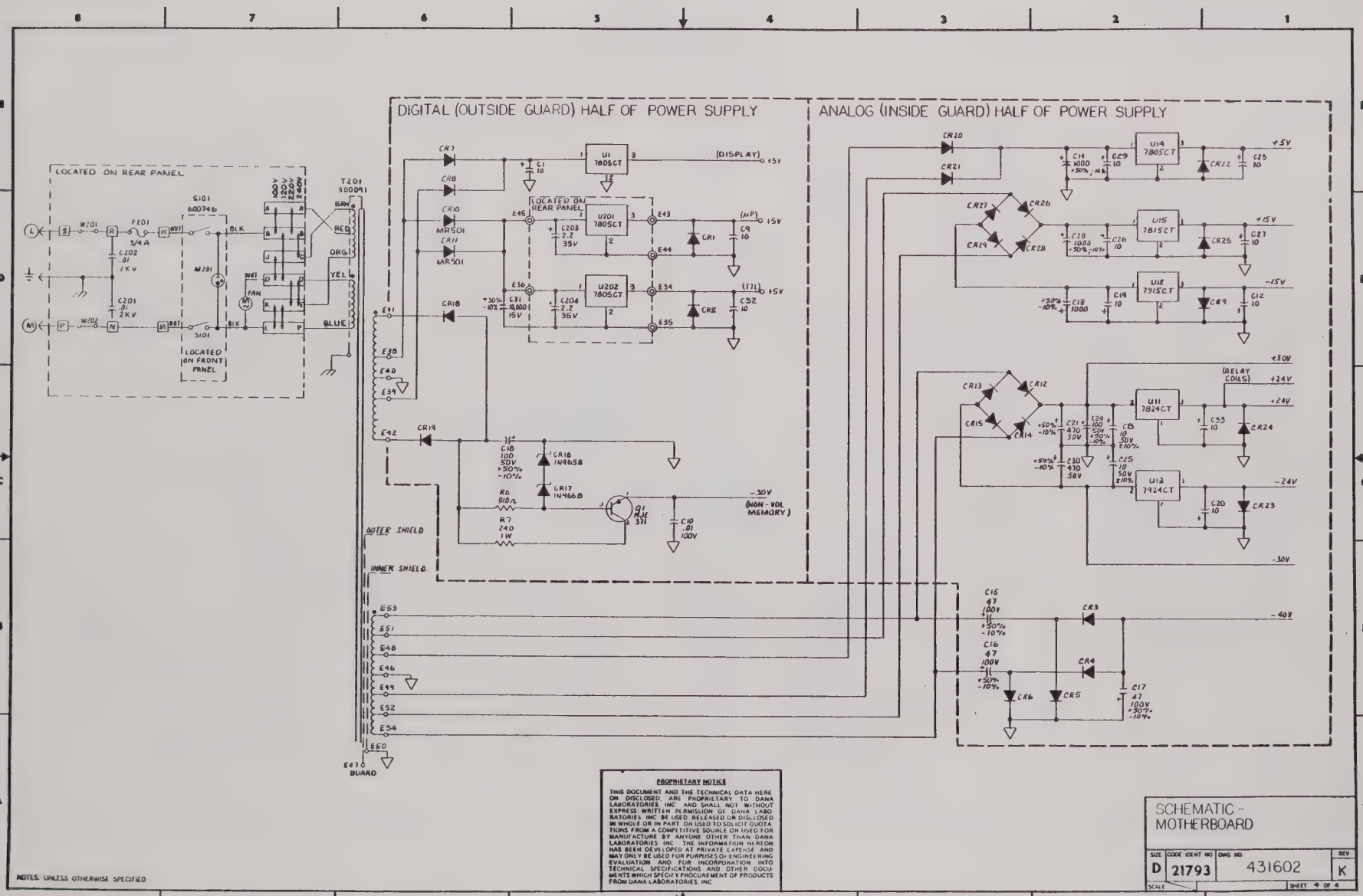
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SCHEMATIC - MOTHERBOARD

SIZE	CODE IDENT NO	DWG NO.	REV
D	21793	431602	K
SCALE		SHEET 3 OF 9	



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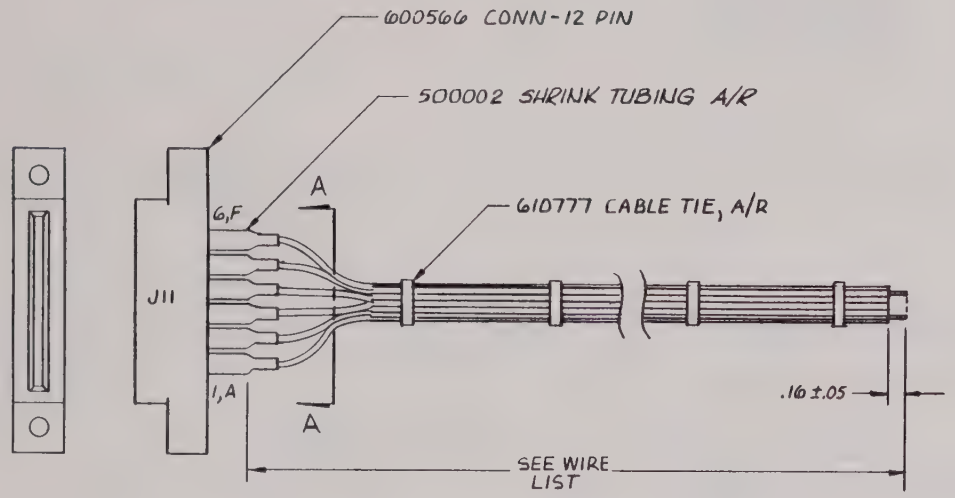
NOTES: UNLESS OTHERWISE SPECIFIED

SCHEMATIC - MOTHERBOARD

SIZE	CODE IDENT NO	DWG NO.	REV
D	21793	431602	K

SCALE

SHEET 4 OF 4





VIEW A-A
SCALE 2/1

F	WHT/RED	524929	18.5
E	WHT/BRN	524919	18.5
D	BLK	524000	18.5
C	WHT	524999	18.5
B	GRA	524888	18.5
A	VIO	524777	19.0
6	BLU	524666	19.0
5	GRN	524555	19.0
4	YEL	524444	19.0
3	ORN	524333	19.0
2	RED	524222	19.5
1	BRN	524111	19.5
J11, PIN #	COLOR	PART NO.	LENGTH ± .15

WIRE LIST

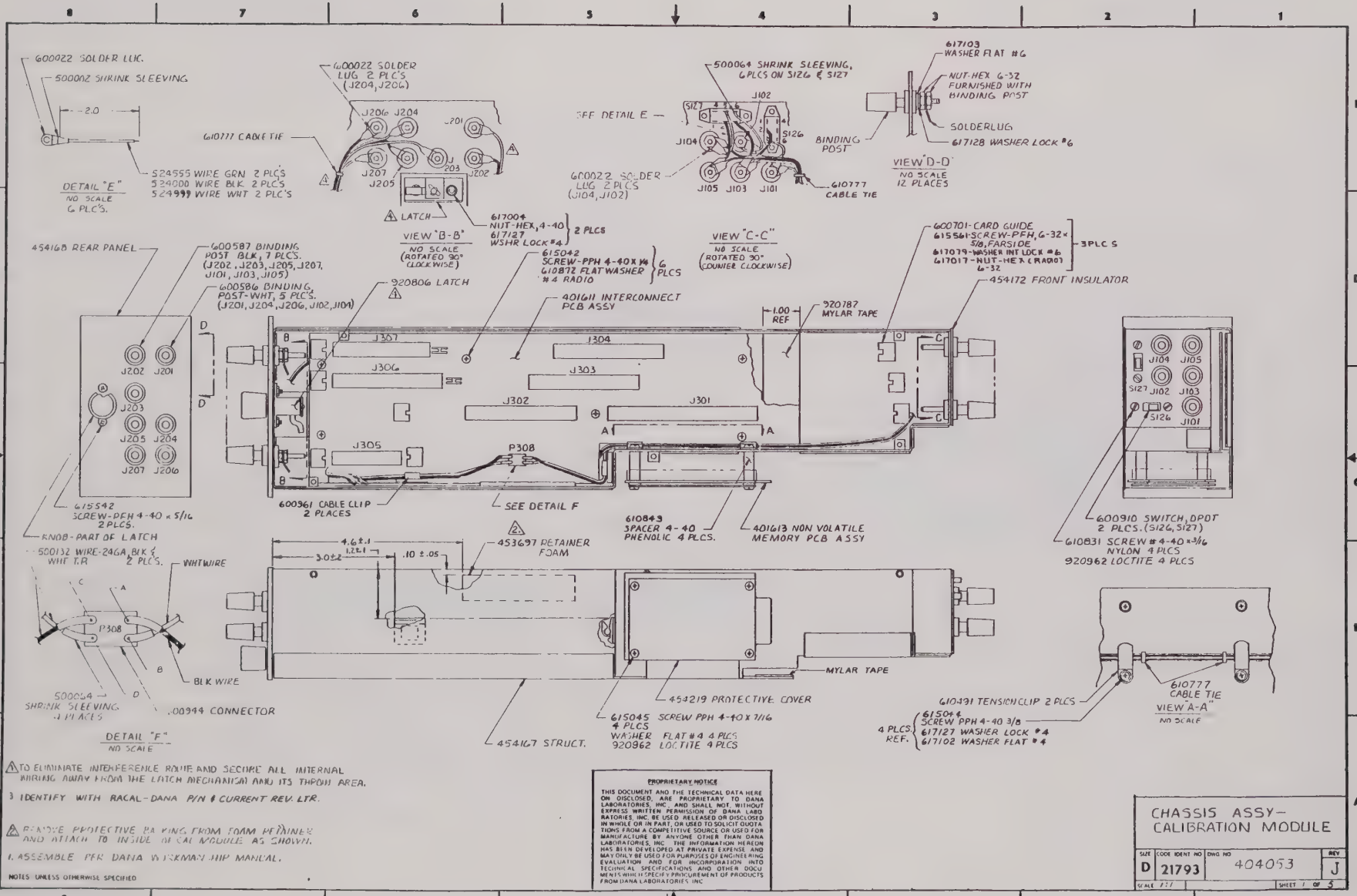
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2. TAG & IDENTIFY WITH DANA P/N & CURRENT REV. LTR.
1. ASSY PROCESSES & PROCEDURES TO CONFORM TO DANA WORKMANSHIP STDS.
NOTES: UNLESS OTHERWISE SPECIFIED

CABLE ASSY - NON-VOLATILE MEMORY

SIZE	CODE IDENT NO	DWG NO	REV
C	21793	404012	B
SCALE 2:1		SHEET 1 OF 2	

7-23


600022 SOLDER LUG.
500002 SHRINK SLEEVING
2.0
DETAIL "E"
NO SCALE
6 PLC'S.
524555 WIRE GRN 2 PLC'S
524000 WIRE BLK 2 PLC'S
524999 WIRE WHT 2 PLC'S
600022 SOLDER LUG 2 PLC'S (J204, J206)
610777 CABLE TIE
J206 J204 J201 J203 J202 J207 J205
LATCH
VIEW "B-B"
NO SCALE (ROTATED 90° CLOCKWISE)
617004 NUT-HEX, 4-40 2 PLCS
617127 WSHR LOCK #4
500064 SHRINK SLEEVING, 6 PLCS ON S126 & S127
SEE DETAIL E
J102 S127 S126 J104 J105 J103 J101
600022 SOLDER LUG 2 PLCS (J104, J102)
610777 CABLE TIE
617103 WASHER FLAT #6
NUT-HEX 6-32 FURNISHED WITH BINDING POST
SOLDERLUG
617128 WASHER LOCK #6
BINDING POST
VIEW "D-D"
NO SCALE
12 PLACES
454168 REAR PANEL
600587 BINDING POST BLK, 7 PLCS. (J202, J203, J205, J207, J101, J103, J105)
600586 BINDING POST-WHT, 5 PLCS. (J201, J204, J206, J102, J104)
920806 LATCH
615042 SCREW-PPH 4-40 X 1/4 6 PLCS
610872 FLAT WASHER #4 RADIO
401611 INTERCONNECT PCB ASSY
VIEW "C-C"
NO SCALE (ROTATED 90° COUNTER CLOCKWISE)
600701-CARD GUIDE
615561-SCREW-PFH, 6-32 x 5/8, FARSIDE
617079-WASHER INT LOCK #6
617017-NUT-HEX (RADIO) 6-32
3 PLC S
454172 FRONT INSULATOR
.100 REF
920787 MYLAR TAPE
J307 J304 J306 J303 J302 J301 J305 P308
600961 CABLE CLIP 2 PLACES
SEE DETAIL F
615542 SCREW-PPH 4-40 x 5/16 2 PLCS.
KNOB-PART OF LATCH
610843 SPACER 4-40 PHENOLIC 4 PLCS.
401613 NON VOLATILE MEMORY PCB ASSY
J104 J105 J102 J103 S127 S126 J101
600910 SWITCH, DPDT 2 PLCS. (S126, S127)
610831 SCREW #4-40 x 3/16 NYLON 4 PLCS
920962 LOCTITE 4 PLCS
500132 WIRE-24GA, BLK & WHT T.R 2 PLCS.
WHT WIRE
BLK WIRE
500064 SHRINK SLEEVING 4 PLACES
.00944 CONNECTOR
DETAIL "F"
NO SCALE
4.6±.1
1.2±.1
3.0±.2
.10 ±.05
453697 RETAINER FOAM
454219 PROTECTIVE COVER
MYLAR TAPE
615045 SCREW PPH 4-40 X 7/16 4 PLCS
WASHER FLAT #4 4 PLCS
920962 LOCTITE 4 PLCS
454167 STRUCT.
610491 TENSION CLIP 2 PLCS
4 PLCS REF.
615044 SCREW PPH 4-40 3/8
617127 WASHER LOCK #4
617102 WASHER FLAT #4
610777 CABLE TIE
VIEW "A-A"
NO SCALE

⚠ TO ELIMINATE INTERFERENCE ROUTE AND SECURE ALL INTERNAL WIRING AWAY FROM THE LATCH MECHANISM AND ITS THROW AREA.

3 IDENTIFY WITH RACAL-DANA P/N & CURRENT REV. LTR.

⚠ REMOVE PROTECTIVE PAPER RING FROM FOAM RETAINER AND ATTACH TO INSIDE OF CAL MODULE AS SHOWN.

1. ASSEMBLE PER DANA WORKMANSHIP MANUAL.

NOTES UNLESS OTHERWISE SPECIFIED

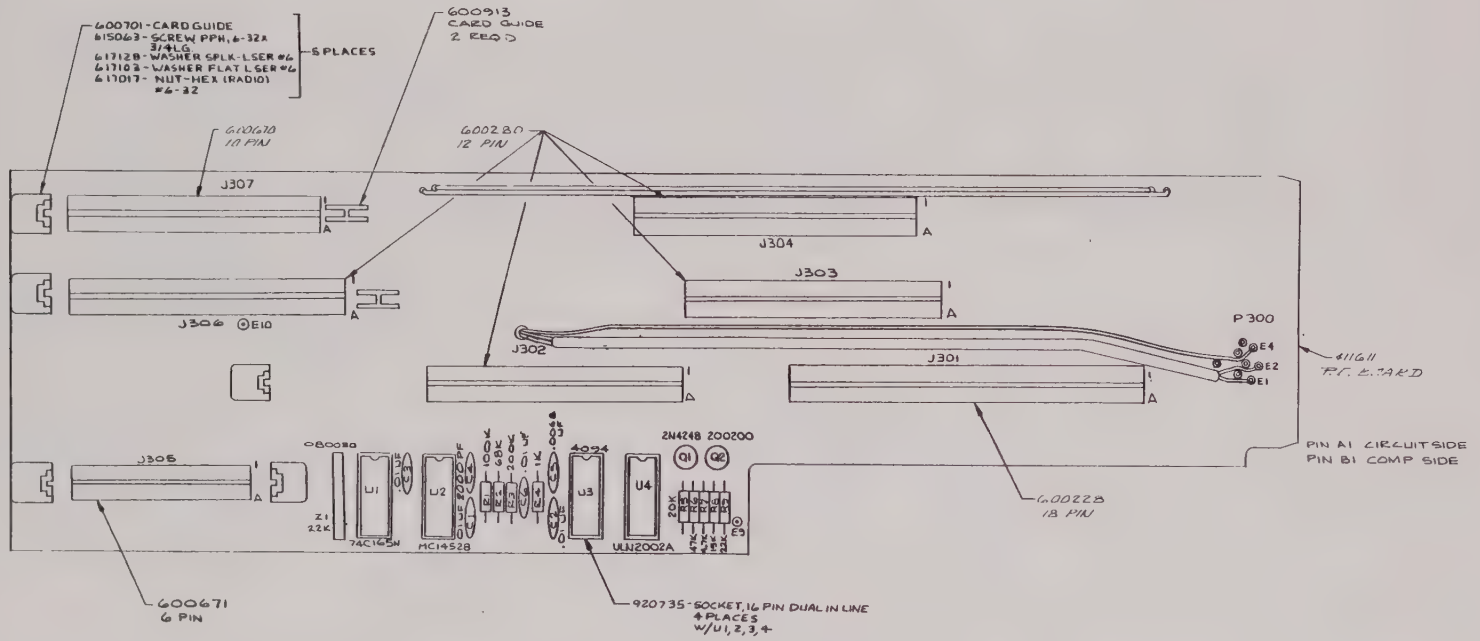
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CHASSIS ASSY-CALIBRATION MODULE

SIZE	CODE IDENT NO	DWG NO	REV
D	21793	404053	J

SCALE 2/1 SHEET 1 OF 3



2. REF SCHEMATIC NO. 831611.
1. ASSY PROCESSES & PROCEDURES TO CONFORM TO DANA WORKMANSHIP STANDARDS.

NOTES: UNLESS OTHERWISE SPECIFIED

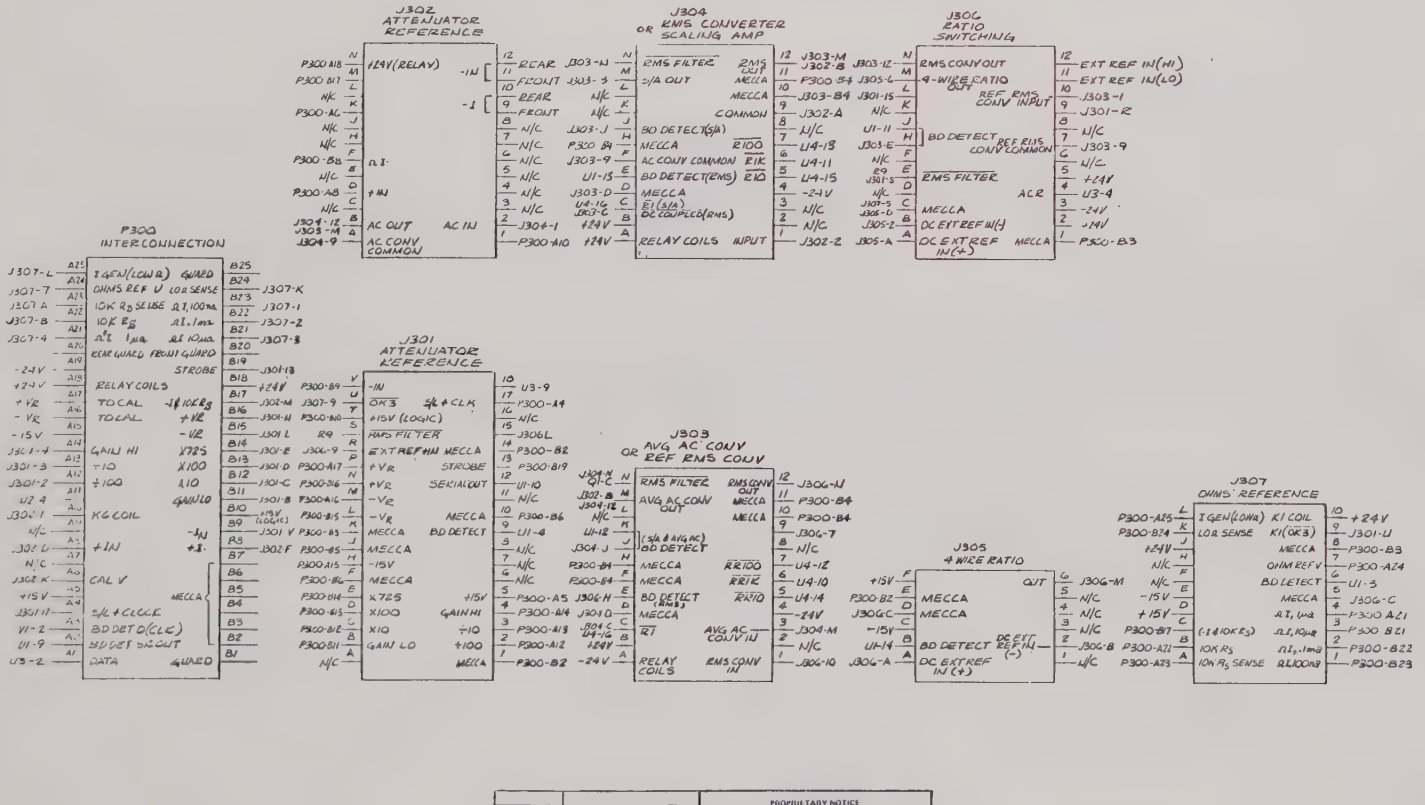
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PCB. ASSY INTERCONNECTION

SIZE	CODE IDENT NO.	DWG NO.	REV
D	21793	401611	R

SCALE 1"=1 SHEET 2 OF 4



Z1	
O2	
U4	
Z9	
Z6	
LAST	NOT USED
DESIGNATORS	

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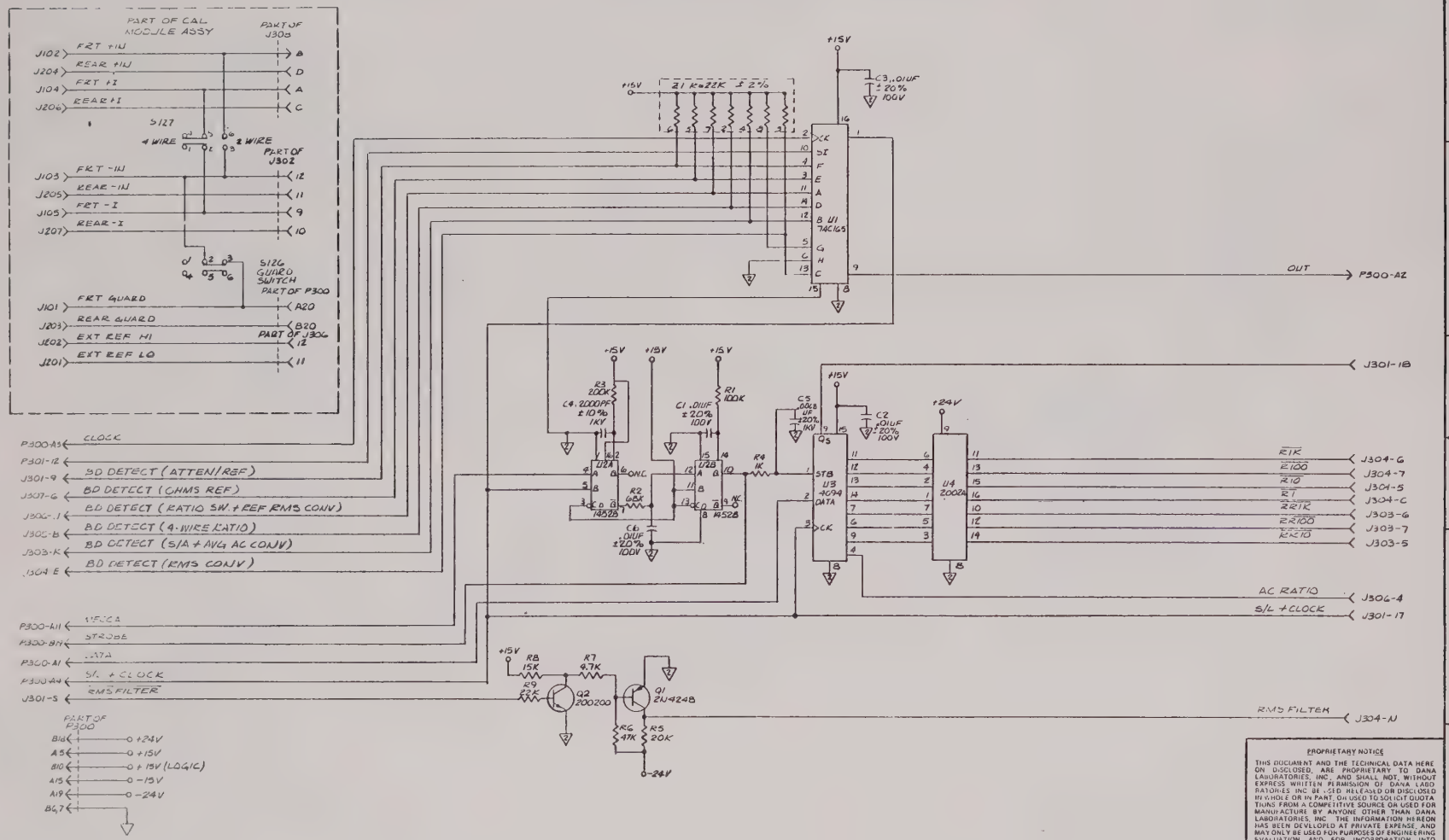
SCHEMATIC-INTERCONNECT,

SIZE	CODE IDENT NO	DWG NO.	REV
D	21793	431611	F

SCALE — SHEET 1 OF 1

1 RESISTORS ARE IN OHMS, 1/4W ±5%

NOTES UNLESS OTHERWISE SPECIFIED



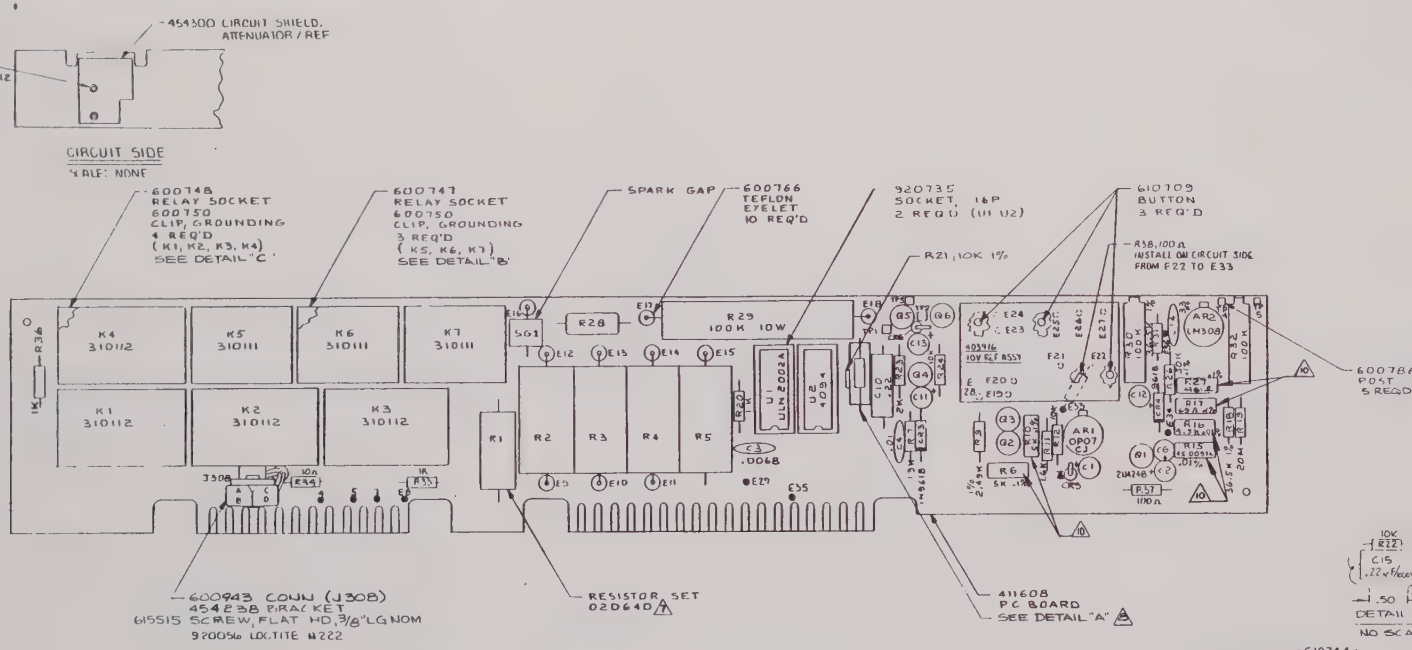
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SIZE	CODE IDENT NO	DWG NO.	REV
D	21793	43611	F

SCALE NONE SHEET 2 OF 2


454300 CIRCUIT SHIELD, ATTENUATOR / REF
615528 - SIM-PFL1H003-48 X 3/8 2 PLACES 920962 - LOCTITE-242 - MED STR A/R
CIRCUIT SIDE
SCALE: NONE
600748 RELAY SOCKET 600750 CLIP, GROUNDING 4 REQ'D (K1, K2, K3, K4) SEE DETAIL "C"
600747 RELAY SOCKET 600750 CLIP, GROUNDING 3 REQ'D (K5, K6, K7) SEE DETAIL "B"
SPARK GAP
600766 TEFLON EYELET 10 REQ'D
920735 SOCKET, 16P 2 REQ'D (U1 U2)
610709 BUTTON 3 REQ'D
R21, 10K 1%
R38, 100Ω INSTALL ON CIRCUIT SIDE FROM E22 TO E33
600786 POST 5 REQD
K4 310112
K5 310111
K6 310111
K7 310111
K1 310112
K2 310112
K3 310112
R28
R29 100K 10W
R1
R2
R3
R4
R5
U1 ULN 2002A
U2 4094
AR1 OP07
AR2 LM308
600943 COUN (J308) 454238 BRACKET 615515 SCREW, FLAT HD, 3/8" LG NOM 920056 LOCTITE #222
RESISTOR SET 02D640 4
411608 P.C. BOARD SEE DETAIL "A" 3
DETAIL "A" NO SCALE
DETAIL "B" TYPICAL LAYOUT FOR K5, K6, K7 VIEWED FROM CIRCUIT SIDE
DETAIL "C" TYPICAL LAYOUT FOR K1, K2, K3, & K4 VIEWED FROM CIRCUIT SIDE
G10744 - STANDOFF .156 H 3-48
SHIELD

COMPONENT SIDE SHOWN

11. AFTER COMPLETION OF ALL OFFLINE SOLDERING, BUT BEFORE INSTALLING RELAYS (K1, K2, K3 K4, K5 K6, K7), THIS ASSEMBLY SHALL BE PRECLEANED USING THE VAPOR CLEANING METHOD.

10. THE FOLLOWING DEVICES ARE TO BE INSTALLED OFFLINE AND ARE NOT TO BE EXPOSED TO THE WAVE SOLDER PROCESS: (P/N 010770) R15, (P/N 010769) R16, (P/N 012037) R17, (P/N 012051) R27, (P/N 010871) R6, & (P/N 010871) R10.

9. WIRES TO BE AS SHORT AS POSSIBLE AND INSTALLED AS CLOSE AS POSSIBLE TO P.C. BOARD TO CLEAR CIRCUIT SHIELD. SLEEVE ALL CONNECTIONS USING 500063-TBGSAK----.093ID.

8. INSTALL C13 INTO HOLES SILKSCREENED R22

4. RESISTOR SET TO CONSIST OF R1 899.45K, R2,3,4,5 22499M, R28 99950K

6. ALL CAPACITORS ARE IN MFD
5. RESISTORS ARE ±5% 1/4W
4. TRANSISTORS Q2 THRU Q6 ARE 200200
3. CAPACITORS C1, 2, 6, 11, 12, 13 ARE 11012G
2. REFERENCE SCHEMATIC NO 43160B
1. ASSEMBLY PROCESSES & PROCEDURES TO CONFORM TO DANA WORKMANSHIP STANDARDS

NOTES UNLESS OTHERWISE SPECIFIED

PROPRIETARY NOTICE

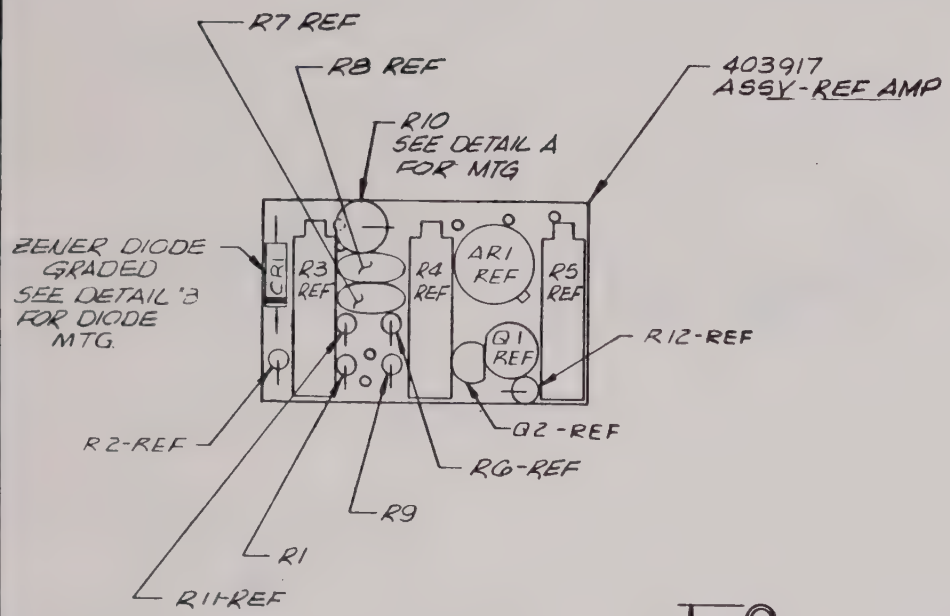
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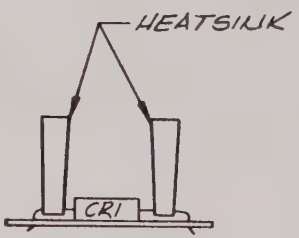
DANA DANA LABORATORIES INC. IRVINE CALIFORNIA

P.C. BOARD ASSY
ATTENUATOR REF

SIZE	CODE IDENT NO	DWG NO	REV
D	21793	401608	AA

SCALE 2/1 SHEET 1 OF 2





DETAIL B
HEATSINK DIODE
LEADS WHILE
SOLDERING

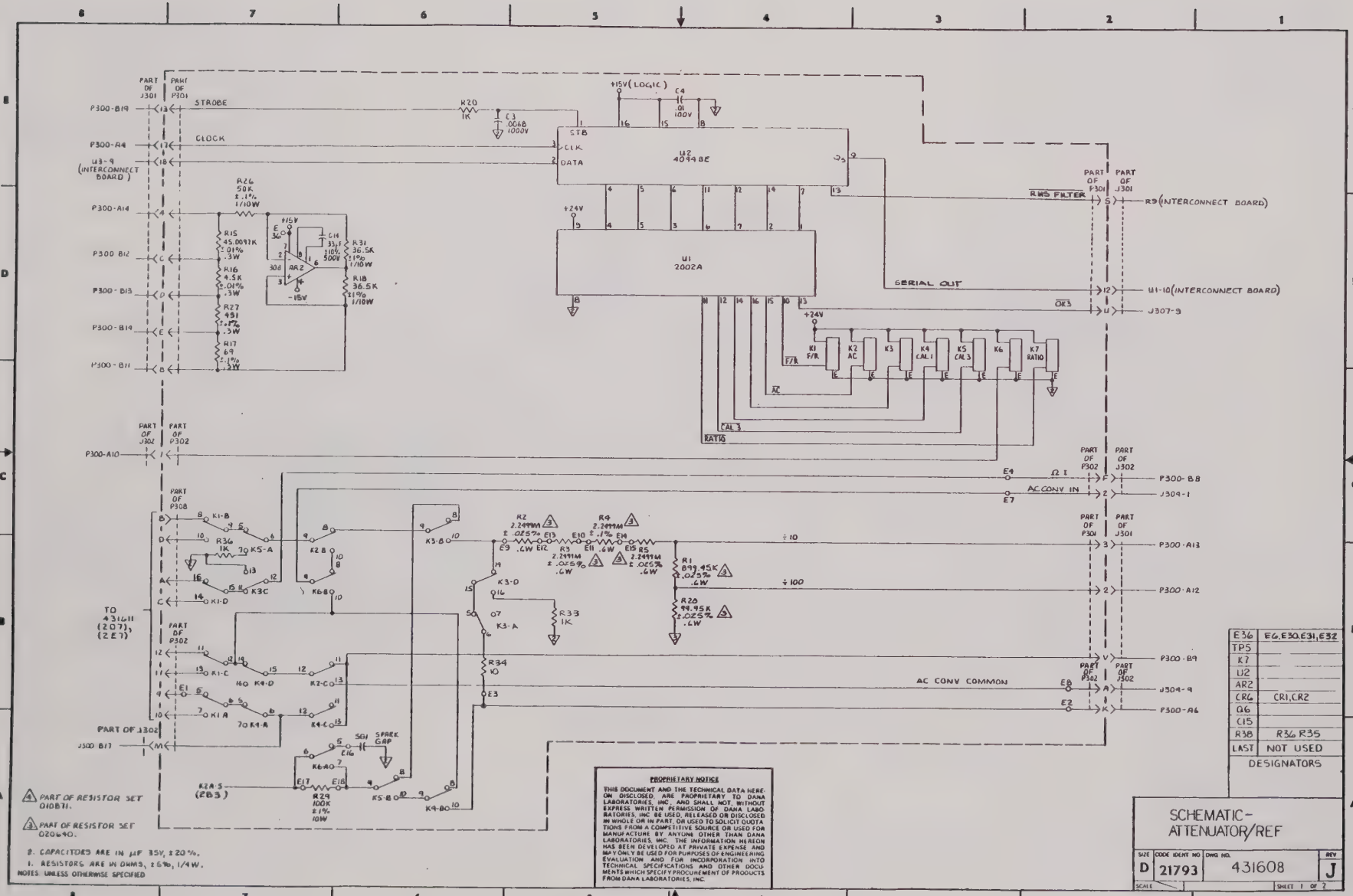


DETAIL A
TYP FOR R1, R9, R10

3. ALL COMPONENTS TO BE .35 MAX. ABOVE PCB
2. SCHEMATIC REF 432008
1. ASSY PROCESSES & PROCEDURES TO CONFORM TO DANA WORKMANSHIP STDS

NOTES: UNLESS OTHERWISE SPECIFIED

ASSY PCB, 10 V REFERENCE			
SIZE B	CODE IDENT NO. 21793	DWG NO. 403916	REV E
SCALE 2/1		SHEET 1 OF 5	



E36	E6, E30, E31, E32
TP5	
K7	
U2	
AR2	
CR6	CR1, CR2
Q6	
C15	
R38	R36 R35
LAST	NOT USED

DESIGNATORS

△4 PART OF RESISTOR SET 010871.

△5 PART OF RESISTOR SET 020640.

2. CAPACITORS ARE IN μF 35V, ±20%.
1. RESISTORS ARE IN OHMS, ±5%, 1/4W.
NOTES: UNLESS OTHERWISE SPECIFIED

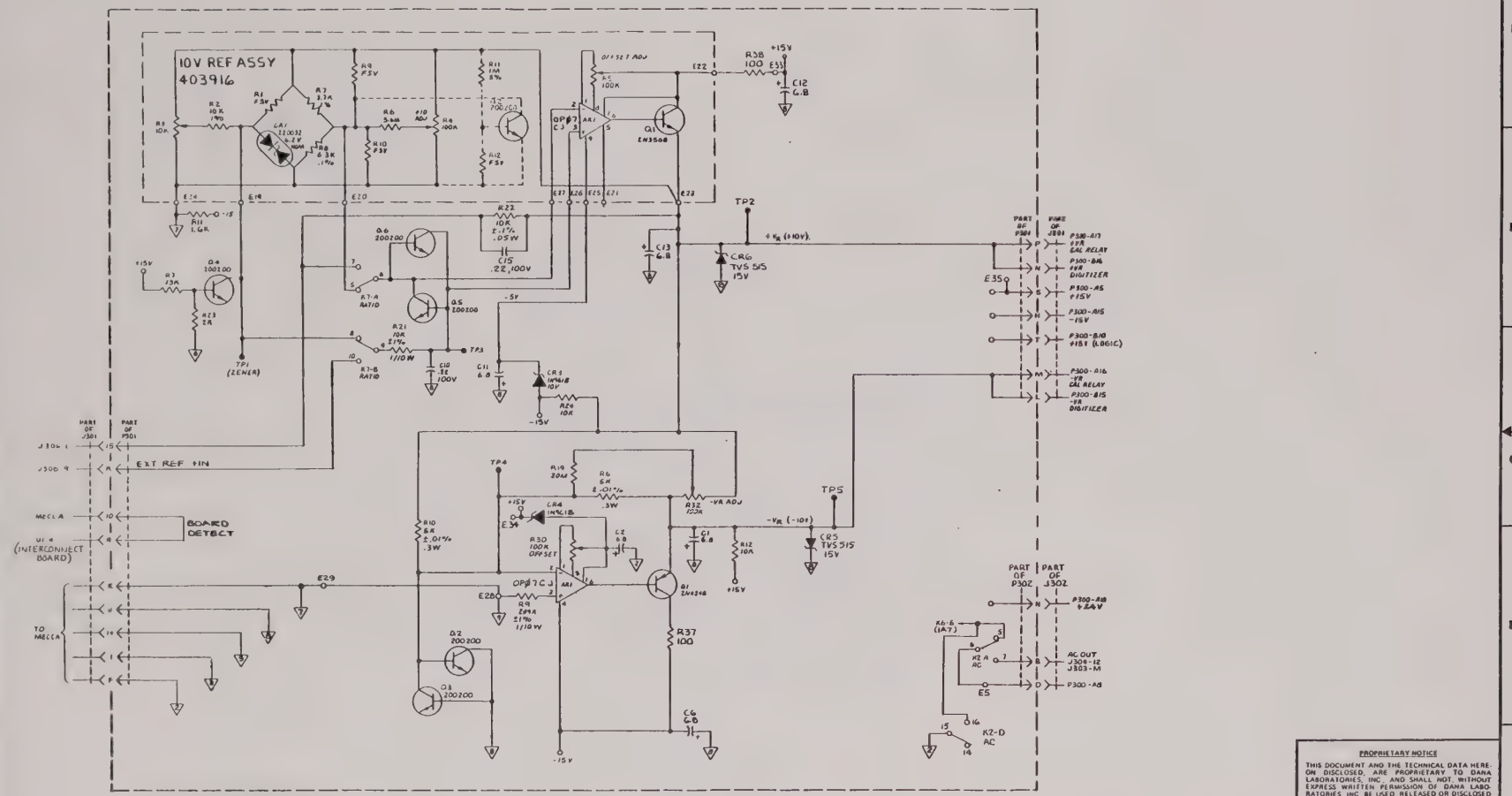
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SCHEMATIC – ATTENUATOR/REF

SIZE	CODE IDENT NO	DWG NO.	REV
D	21793	431608	J

SCALE | SHEET 1 OF 2



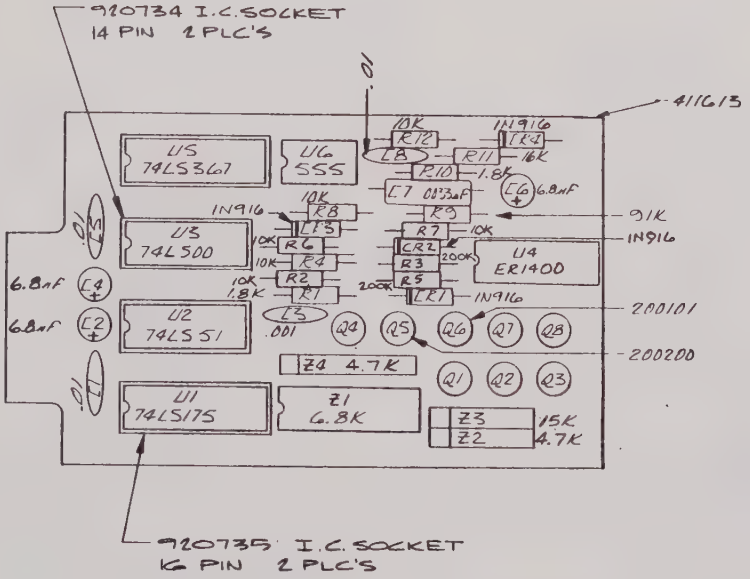
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SIZE	CODE IDENT NO	DWG NO.	REV
D	21793	431608	J
SCALE		SHEET 2 OF 2	

7.31



3. TRANSISTORS Q1 - 4, 7, 8 ARE NO. 2000888.
2. REF. SCHEMATIC NO. 431613.
1. ASSY PROCESSES & PROCEDURES TO CONFORM TO DANA WORKMANSHIP STANDARDS.

NOTES: UNLESS OTHERWISE SPECIFIED

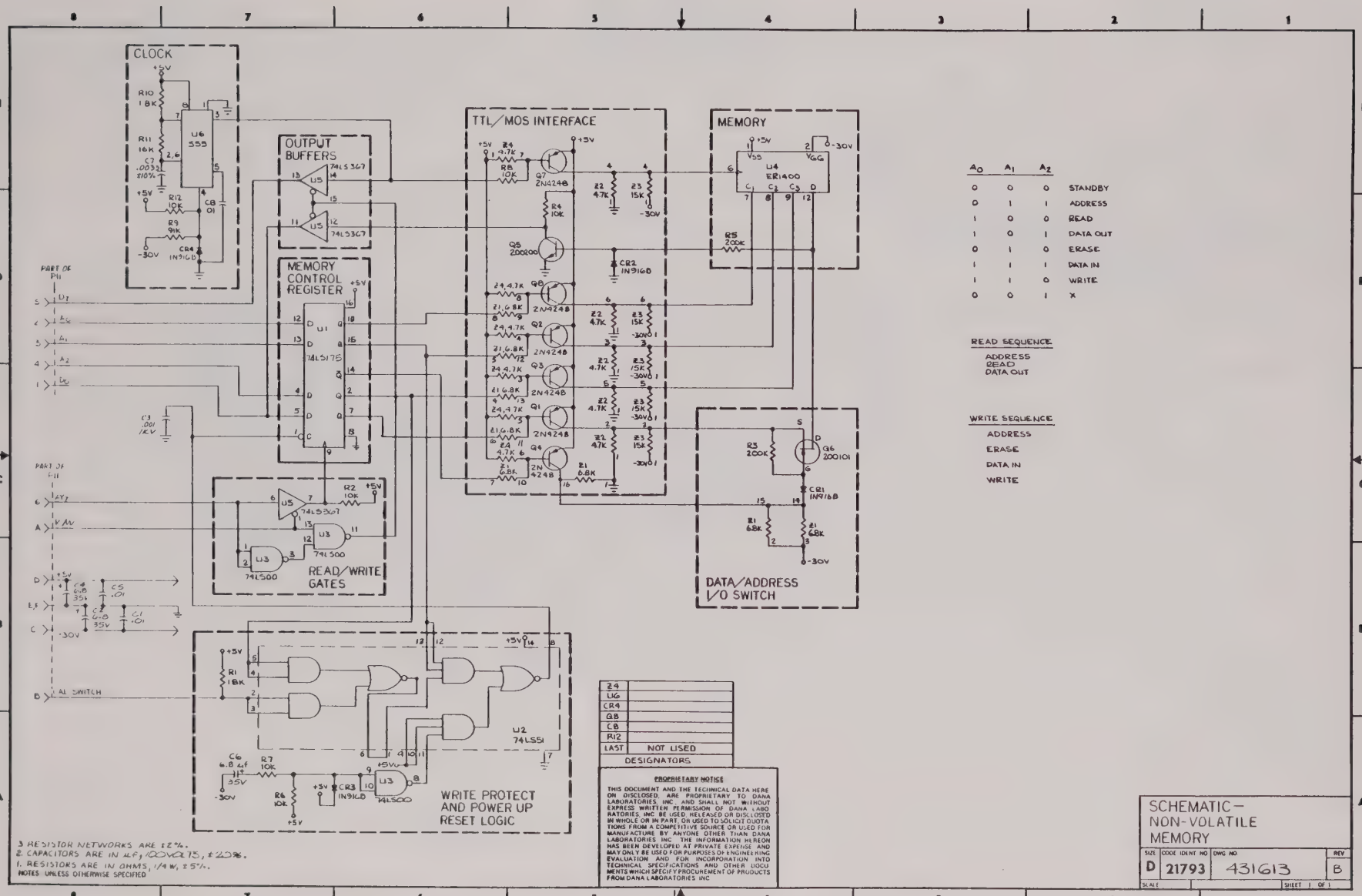
PROPRIETARY NOTICE

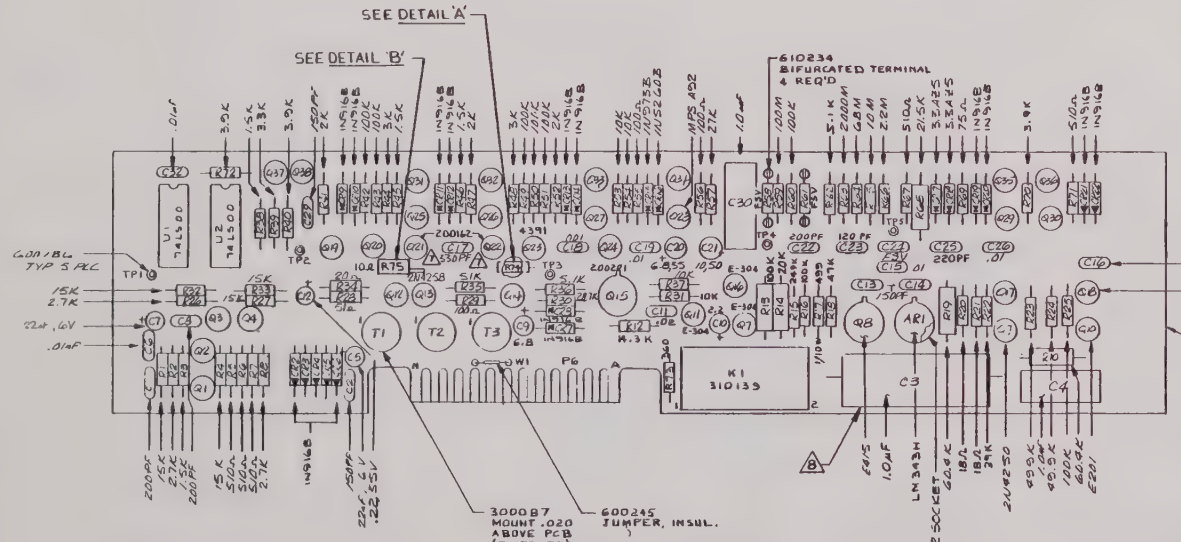
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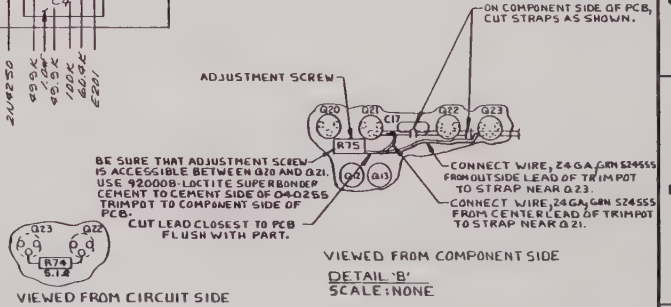
PCB ASSY
NON-VOLATILE
MEMORY

SIZE	CODE IDENT NO	DWG NO.	REV
C	21793	401613	D

SCALE 2X1 | SHEET 1 OF 3


CLOCK
OUTPUT BUFFERS
MEMORY CONTROL REGISTER
TTL/MOS INTERFACE
MEMORY
READ/WRITE GATES
DATA/ADDRESS I/O SWITCH
WRITE PROTECT AND POWER UP RESET LOGIC
A0 A1 A2
0 0 0 STANDBY
0 0 1 ADDRESS
1 0 0 READ
1 0 1 DATA OUT
0 1 0 ERASE
1 1 1 DATA IN
1 1 0 WRITE
0 0 1 X
READ SEQUENCE
ADDRESS
READ
DATA OUT
WRITE SEQUENCE
ADDRESS
ERASE
DATA IN
WRITE
Z4
LIG
CR9
Q8
C8
RI2
LAST NOT USED
DESIGNATORS
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3 RESISTOR NETWORKS ARE ±2%.
2. CAPACITORS ARE IN µF, 100VOLTS, ±20%.
1. RESISTORS ARE IN OHMS, 1/4 W, ±5%.
NOTES UNLESS OTHERWISE SPECIFIED
SCHEMATIC – NON-VOLATILE MEMORY
SIZE D
CODE IDENT NO 21793
DWG NO 431613
REV B
SCALE
SHEET 1 OF 1




ADJUSTMENT SCREW
ON COMPONENT SIDE OF PCB, CUT STRAPS AS SHOWN.
BE SURE THAT ADJUSTMENT SCREW IS ACCESSIBLE BETWEEN Q20 AND Q21. USE 920008-LOCTITE SUPERBONDER CEMENT TO CEMENT SIDE OF 040255 TRIMPOT TO COMPONENT SIDE OF PCB.
CUT LEAD CLOSEST TO PCB FLUSH WITH PART.
CONNECT WIRE, 24 GA, GRN S24555 FROM OUTSIDE LEAD OF TRIMPOT TO STRAP NEAR Q23.
CONNECT WIRE, 24 GA, GRN S24555 FROM CENTER LEAD OF TRIMPOT TO STRAP NEAR Q21.
VIEWED FROM COMPONENT SIDE
DETAIL 'B'
SCALE: NONE
VIEWED FROM CIRCUIT SIDE
DETAIL 'A'
SCALE: NONE

⚠B APPLY APPROX 1/2" DIA "POOL" OF 920808 ADHESIVE BETWEEN 411609 PC BOARD & 120326 C3.

⚠A INSTALL TWO OF THE THREE 200162 FETS FOR Q21, Q22. DISCARD FET MARKED 200162-6.

6 TRANSISTORS —— Q17, 30, 34, 36, 38 ARE PART NO. 200200.
5 TRANSISTORS Q1, 2, 3, 4, 12, 14 ARE PART NO. 200037.
4 TRANSISTORS Q25, 27, 31 ARE PART NO. 200229.
3 TRANSISTORS Q19, 20, 24, 26, 29, 32, 33, 35, 37 ARE PART NO. 2N4248
2 ASSY PROCESSES & PROCEDURES TO CONFORM TO DANA WORKMANSHIP STANDARDS.
1 SCHEMATIC REF NO 431609

NOTES: UNLESS OTHERWISE SPECIFIED

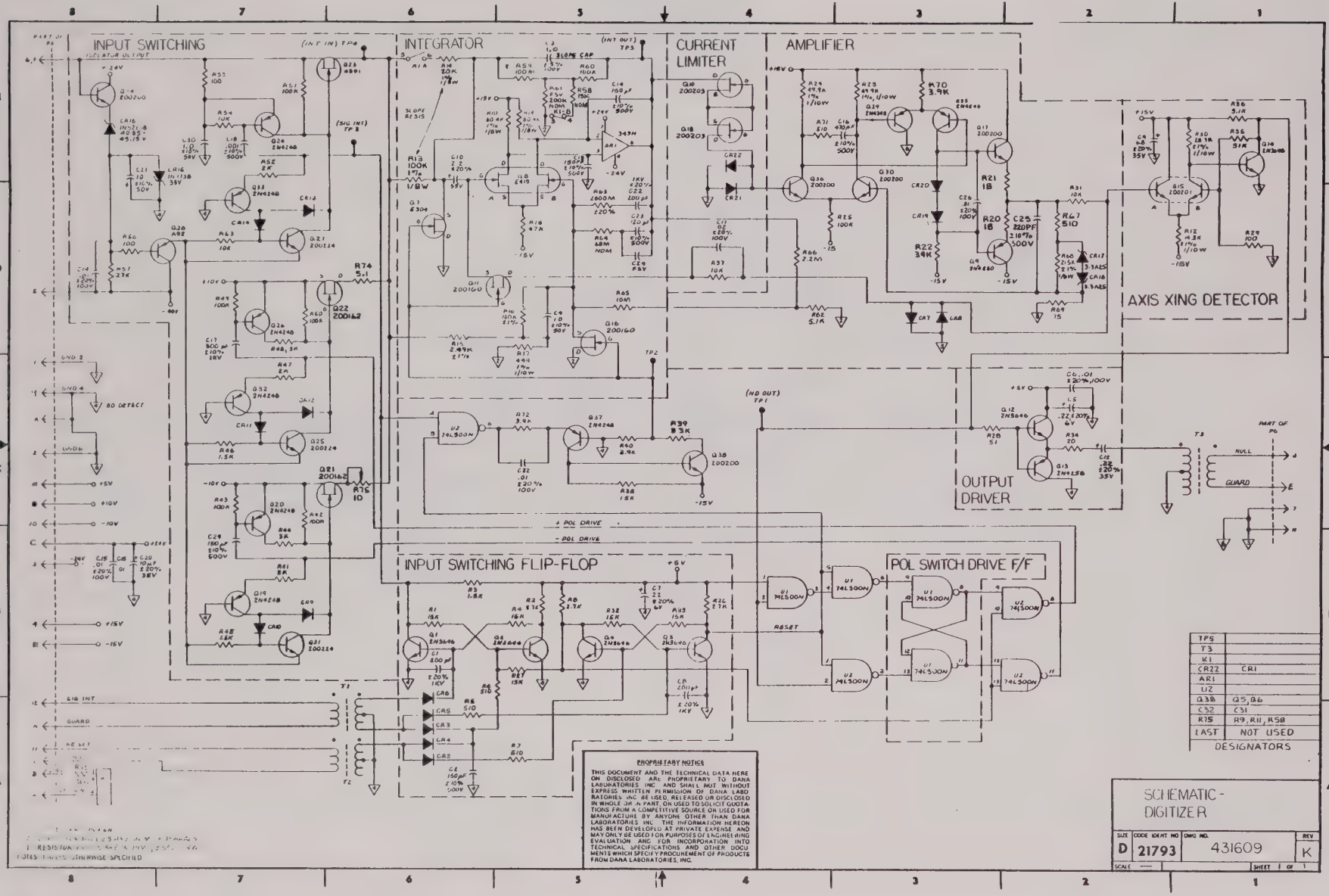
PROPRIETARY NOTICE

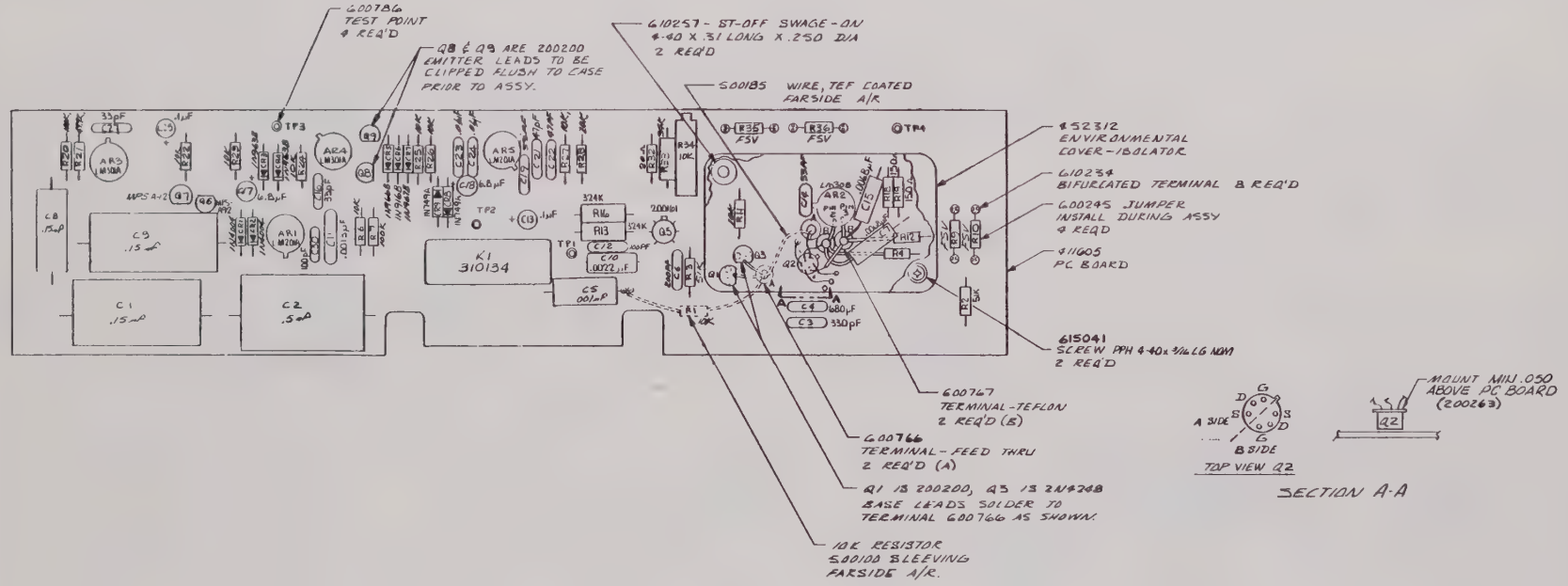
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PCB ASSY
DIGITIZER

SIZE	CODE IDENT NO	DWG NO.	REV
D	21793	401609	N

SCALE 2/1 SHEET 1 OF 1


INPUT SWITCHING
INTEGRATOR
CURRENT LIMITER
AMPLIFIER
AXIS XING DETECTOR
OUTPUT DRIVER
INPUT SWITCHING FLIP-FLOP
POL SWITCH DRIVE F/F
SLOPE RESIS
+ POL DRIVE
- POL DRIVE
RESET
NULL
GUARD
TPS
T3
K1
CR22 CR1
AR1
U2
Q38 Q5, Q6
C32 C31
R15 R9, R11, R58
LAST NOT USED
DESIGNATORS
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SCHEMATIC - DIGITIZER
SIZE D
CODE IDENT NO 21793
DWG NO. 431609
REV K
SCALE —
SHEET 1 OF 1



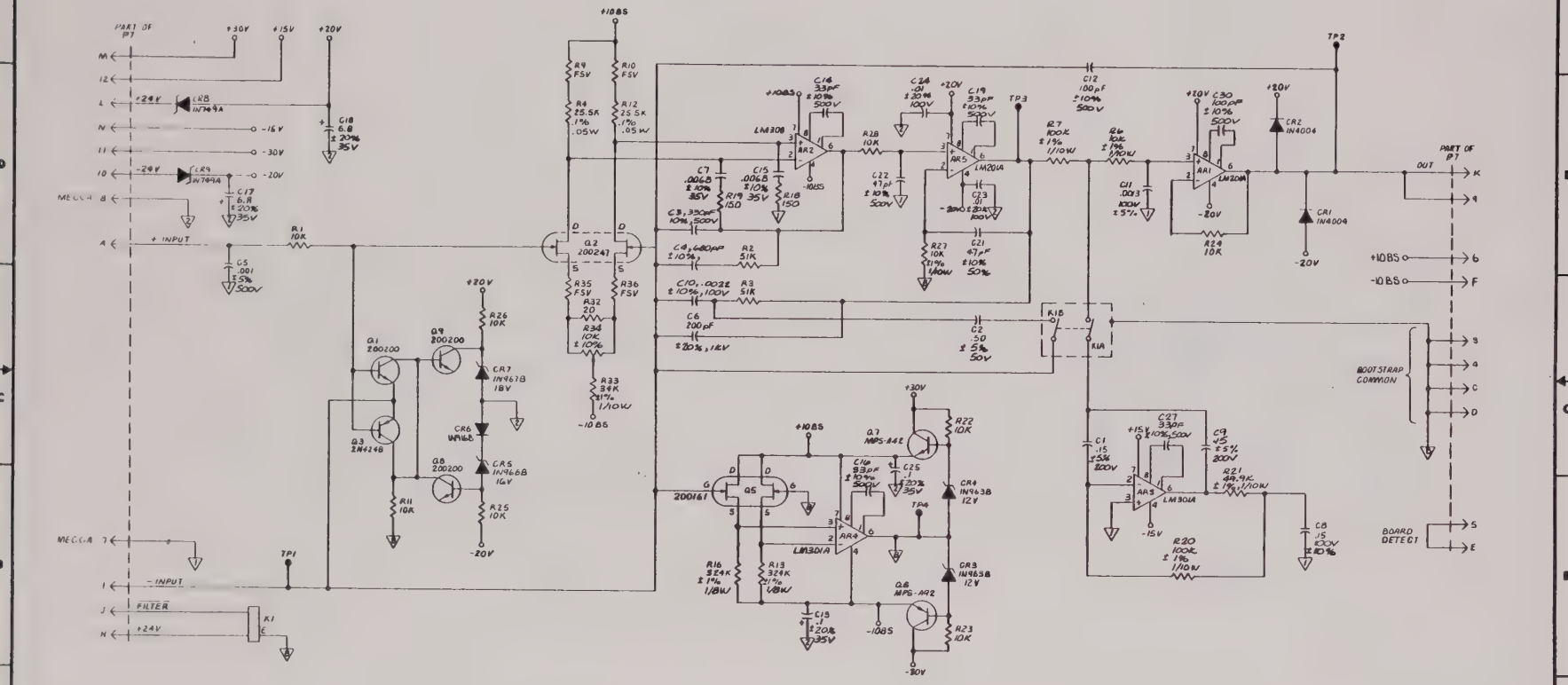
2 REFERENCE SCHEMATIC NO 431605
1 ASSEMBLE PER RACAL DANA WORKMANSHIP MANUAL
NOTES: UNLESS OTHERWISE SPECIFIED

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ASSY
A/T ISOLATOR

SIZE	CODE IDENT NO	DWG NO	REV
D	21793	411605	K

SCALE — SHEET 1 OF 1



TP4	
R36	Q5,8,14,15,17 R29-31
C29	
C30	C20,24,28,29
Q9	Q4
K1	
AR5	
LAST USED	NOT USED

DESIGNATORS

PROPRIETARY NOTICE

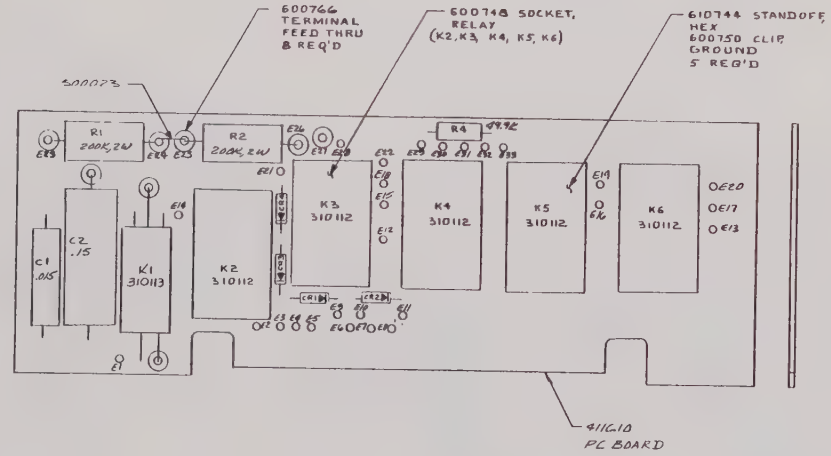
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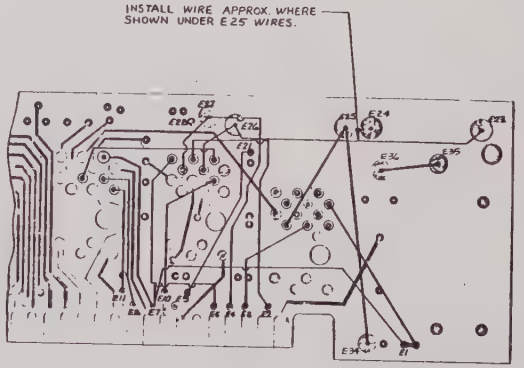
2 CAPACITORS ARE IN MICROFARADS.
ALL RESISTORS IN OHMS ±5%, 1/4 WATT.
NOTES: UNLESS OTHERWISE SPECIFIED

SCHEMATIC - ISOLATOR

SIZE	CODE IDENT NO	DWG NO.	REV
D	21793	431605	C

SCALE NONE | SHEET 1 OF





(SEE WIRE LIST)

CIRCUIT SIDE SHOWN

5. ALL DIODES ARE 211083.
2. ASSY PROCESSES & PROCEDURES TO CONFORM TO DANA WORKMANSHIP STANDARDS.
1. REF SCHEMATIC NO. 931610.

NOTES UNLESS OTHERWISE SPECIFIED

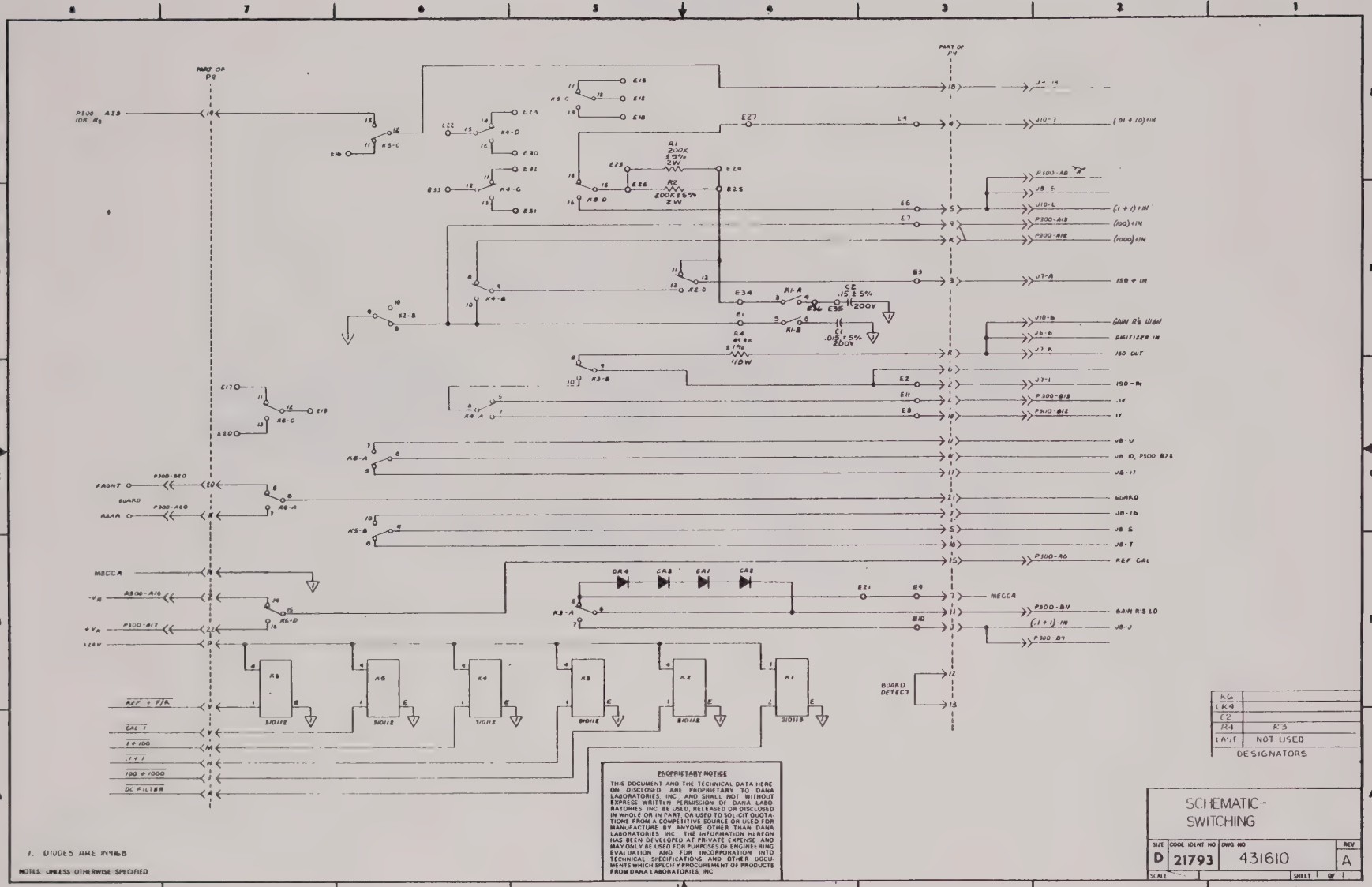
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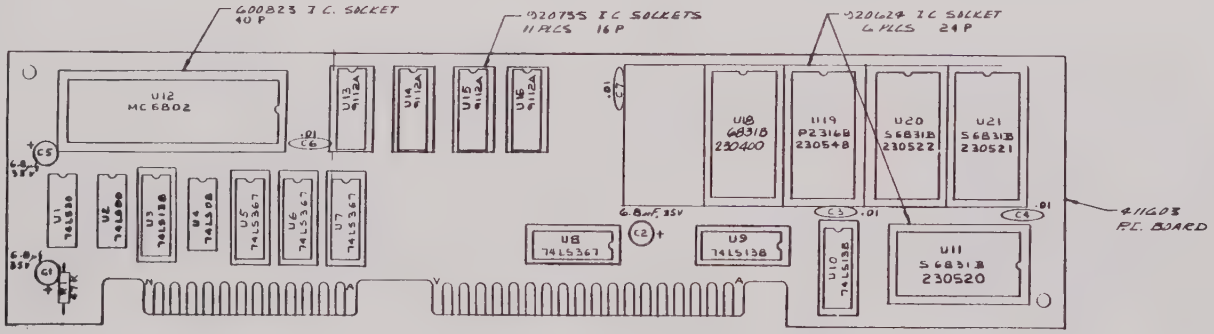
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PCB ASSY
SWITCHING

SIZE	CODE IDENT NO	DWG NO.	REV
D	21793	401610	E

SCALE 2/1 SHEET 1 OF 4


PART OF P4
PART OF P9
P300 A23 10K A5
E18
E12
E16
K5-C
E24
K4-D
E30
E22
K4-C
E31
E23
E26
E29
R1 200K ±5% 2W
R2 200K ±5% 2W
E27
E9
J10-7
(.01 + 10) +IN
E5
J10-L
(1 + 1) +IN
E7
P300-A19
(100) +IN
P300-A18
(1000) +IN
E3
J7-A
150 + IN
K1-A
C2 .15, ±5% 200V
E36
E35
K2-B
E1
K1-B
C1 .015 ±5% 200V
R4 49.9K ±1% 1/8W
J10-b
GAIN R'S HIGH
J6-b
DIGITIZER IN
J7 R
150 OUT
K3-B
E2
J7-1
150 - IN
E11
P300-B13
.1V
E8
P300-B12
1V
E17
E19
K6-C
E20
K6-A
J8-U
J8 10, P300 B23
J8-17
FRONT
P300-B20
GUARD
A,AA
P300-A20
K6-B
GUARD
J8-16
K5-B
J8 5
J8-T
P300-A6
REF CAL
MEGGA
-VR
A300-A16
+VR
P300-A17
+12V
K6-D
DR9
CR8
CR1
CR6
E21
E9
MEGGA
K3-A
P300-B11
GAIN R'S LO
E10
J8-J
(1 + 1) -IN
P300-B9
K6
K5
K4
K3
K2
K1
BOARD DETECT
REF ÷ F/R
CAL 1
1 ÷ 100
.1 ÷ 1
100 ÷ 1000
DC FILTER
1. DIODES ARE IN916B
NOTES: UNLESS OTHERWISE SPECIFIED
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K6
CR4
C2
R4
A13
CR5F
NOT USED
DESIGNATORS
SCHEMATIC-SWITCHING
SIZE D
CODE IDENT NO 21793
DWG NO 431610
REV A
SCALE
SHEET 1 OF 1



COMPONENT SIDE SHOWN

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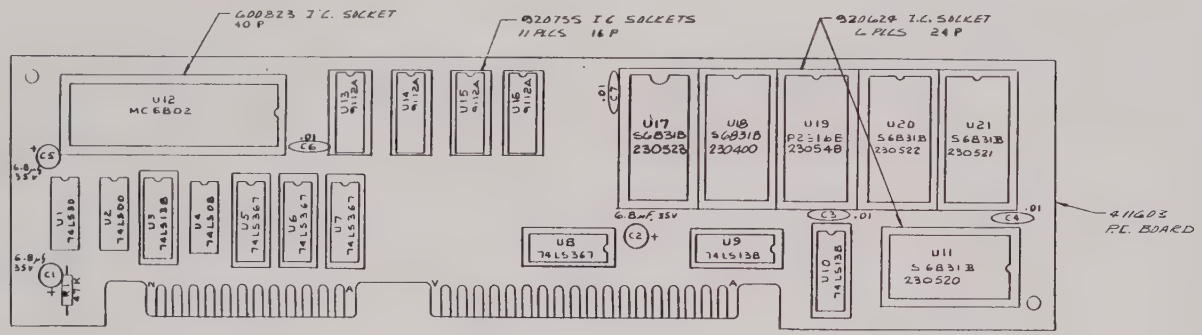
2 REF SCHEMATIC DWG #31603.
1. ASSY PROCESSES & PRACTICES TO CONFORM TO DANA WORKMANSHIP STANDARDS.

NOTES: UNLESS OTHERWISE SPECIFIED

PCB ASSY
COMPUTER I

SIZE	CODE IDENT NO	DWG NO	REV
D	21793	401603	E

SCALE 2/1 SHEET 1 OF 5



COMPONENT SIDE SHOWN

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2 REF SCHEMATIC DWG 431603.
1 ASSY PROCESSES & PROCEDURES TO CONFORM TO DANA WORKMANSHIP STANDARDS.

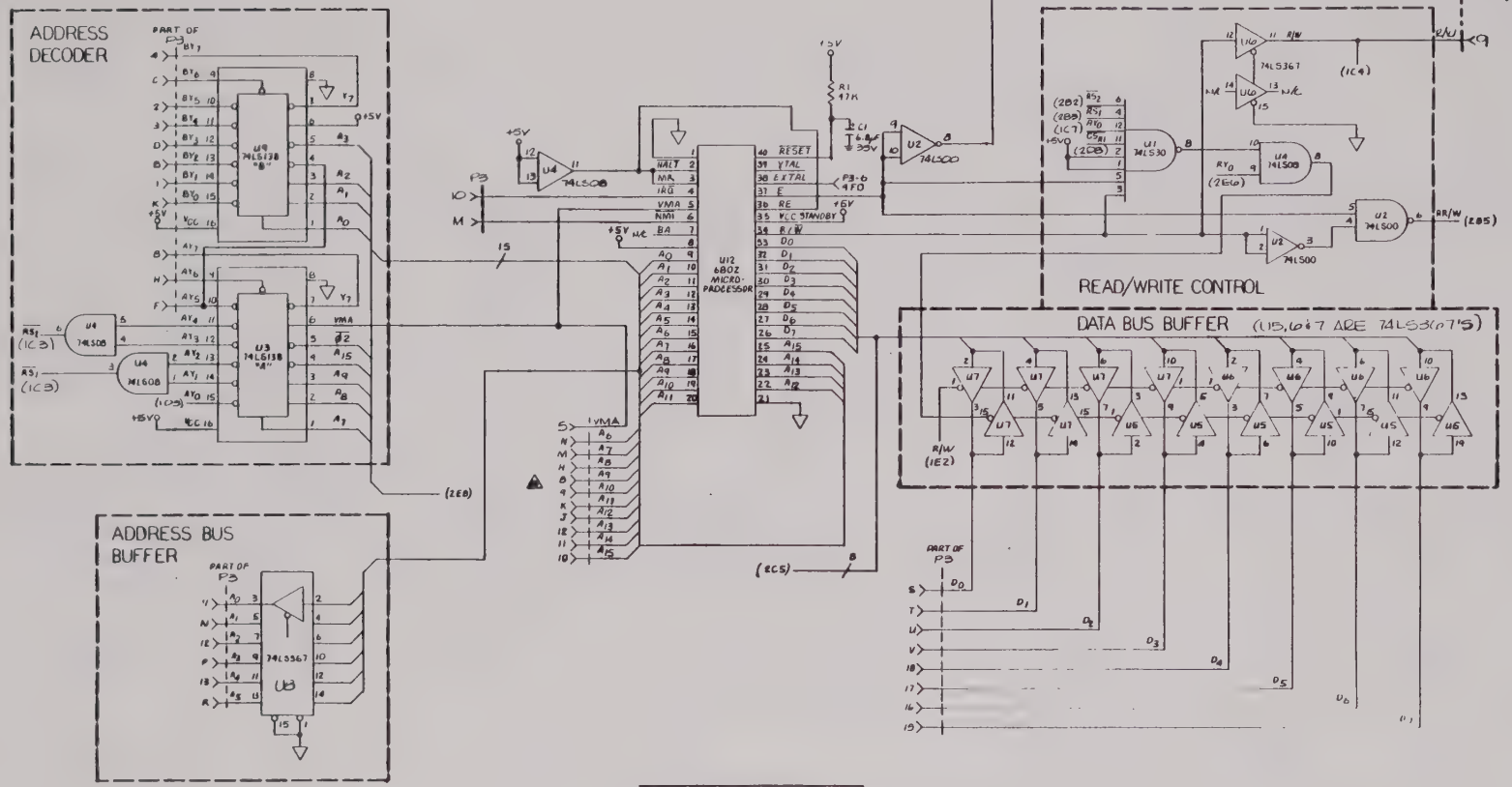
NOTES: UNLESS OTHERWISE SPECIFIED

PCB ASSY
COMPUTER 1

SIZE	CODE IDENT NO	DWG NO	REV
D	21793	404171	B

SCALE 2/1 SHEET 1 OF 5

7410



⚠ U17 USED WITH OPTIONS 58 & 59 ONLY.
⚠ CONNECTOR USED ONLY FOR SPECIALS.
2. CAPACITORS ARE IN µF, 100V, ±20%.
1. RESISTORS ARE IN OHMS, ±5%, 1/4W
NOTES: UNLESS OTHERWISE SPECIFIED

U21	
R1	
C7	
LAST DESIGNATORS	NOTICE

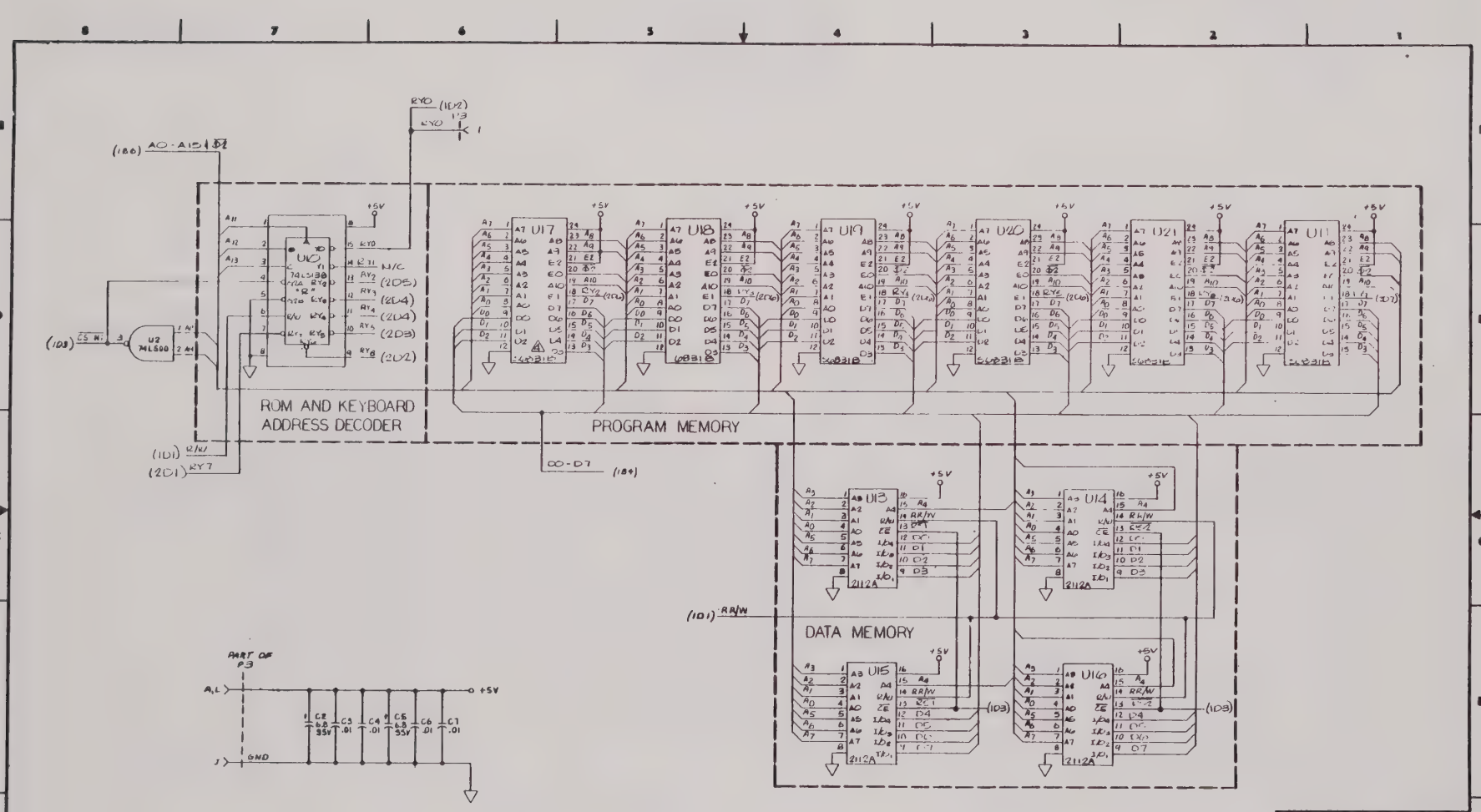
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SCHEMATIC - COMPUTER I

SIZE	CODE IDENT NO	DWG NO	REV
D	21793	431603	C

SCALE | SHEET 1 OF 2

7-41

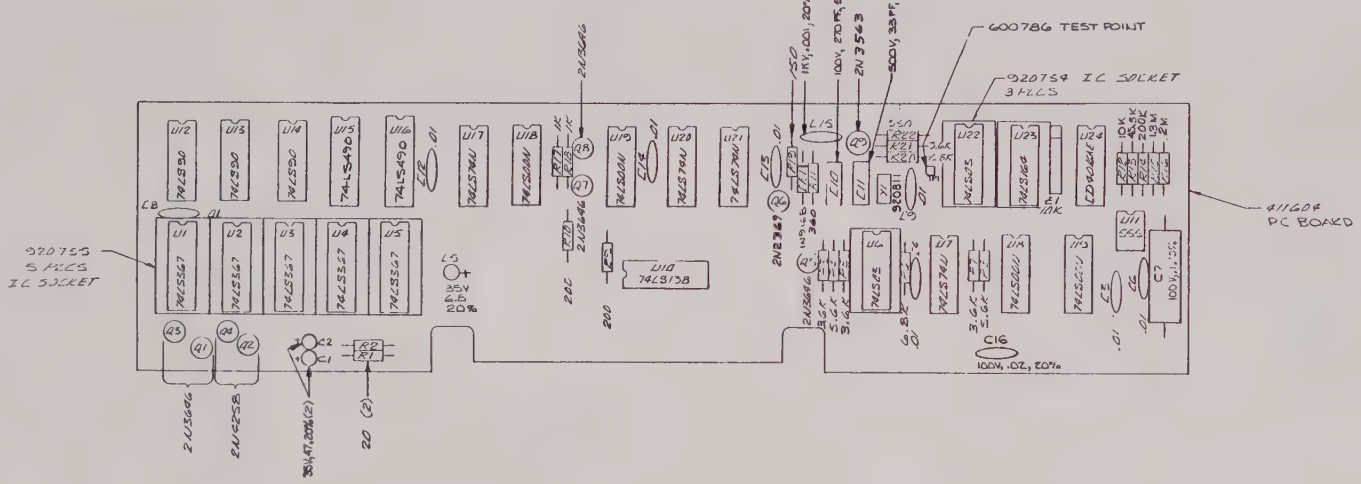


NOTES: UNLESS OTHERWISE SPECIFIED

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SIZE	CODE IDENT NO	DWG NO	REV
D	21793	431603	C
SCALE		SHEET 3 OF 7	



NOTES UNLESS OTHERWISE SPECIFIED

1. CAPACITOR VALUES ARE IN MICROFARADS
2. RESISTOR VALUES ARE IN OHMS, 5%, 1/4W.
3. [illegible] SCHEMATIC 401604.
4. [illegible] PRICES & DELIVERIES TO LOVAIR.
5. [illegible] MATERIAL [illegible] SPECIAL NOTE.

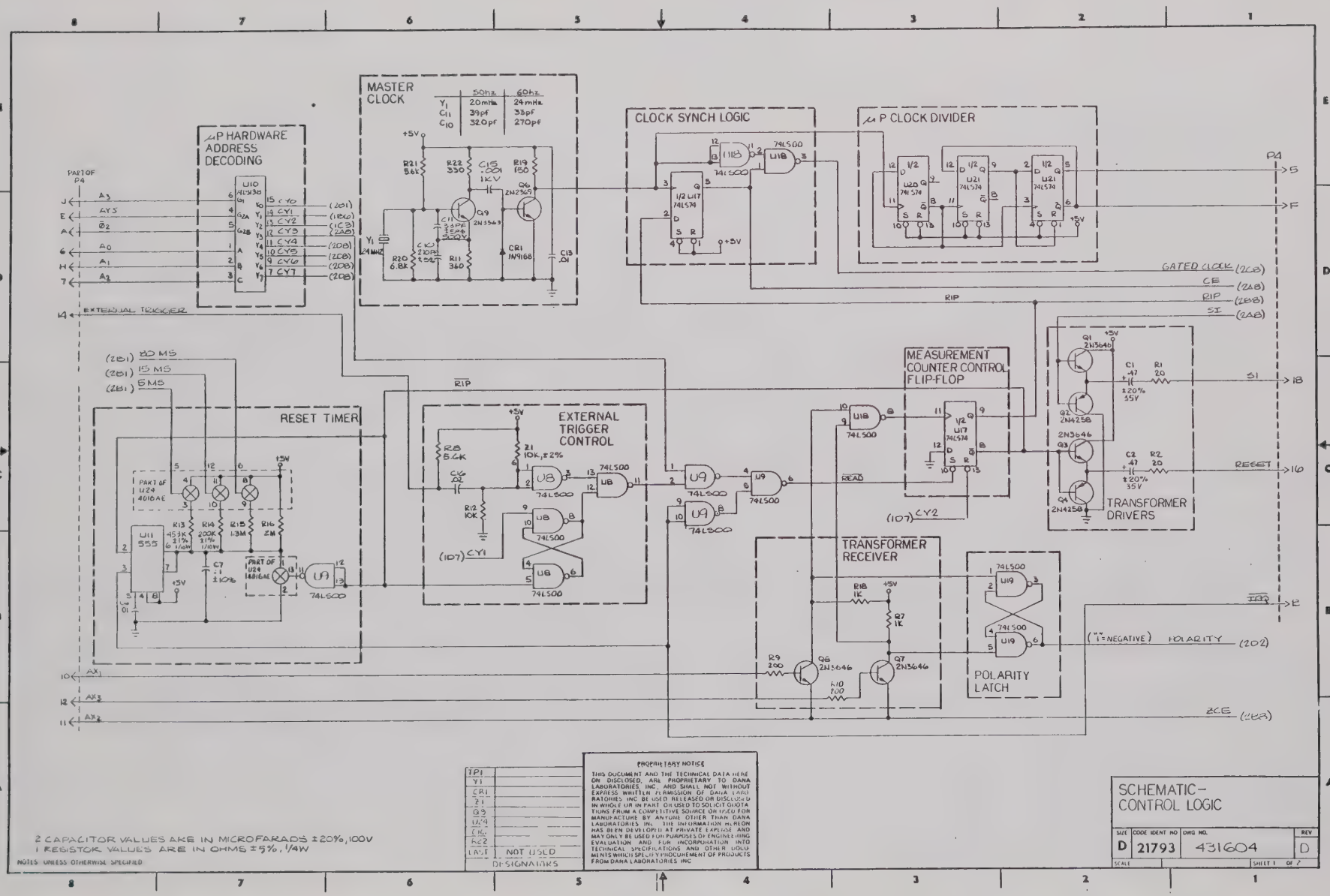
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P.C.B. ASSY
CONTROL LOGIC

SIZE	CODE IDENT NO	DWG NO.	REV
D	21793	401604	K

SCALE [illegible] SHEET 1 OF 2



2 CAPACITOR VALUES ARE IN MICROFARADS ±20%, 100V
1 RESISTOR VALUES ARE IN OHMS ±5%, 1/4W
NOTES UNLESS OTHERWISE SPECIFIED

TP1	
Y1	
CR1	
Z1	
Q9	
U19	
C16	
RZ2	
LAST	NOT USED

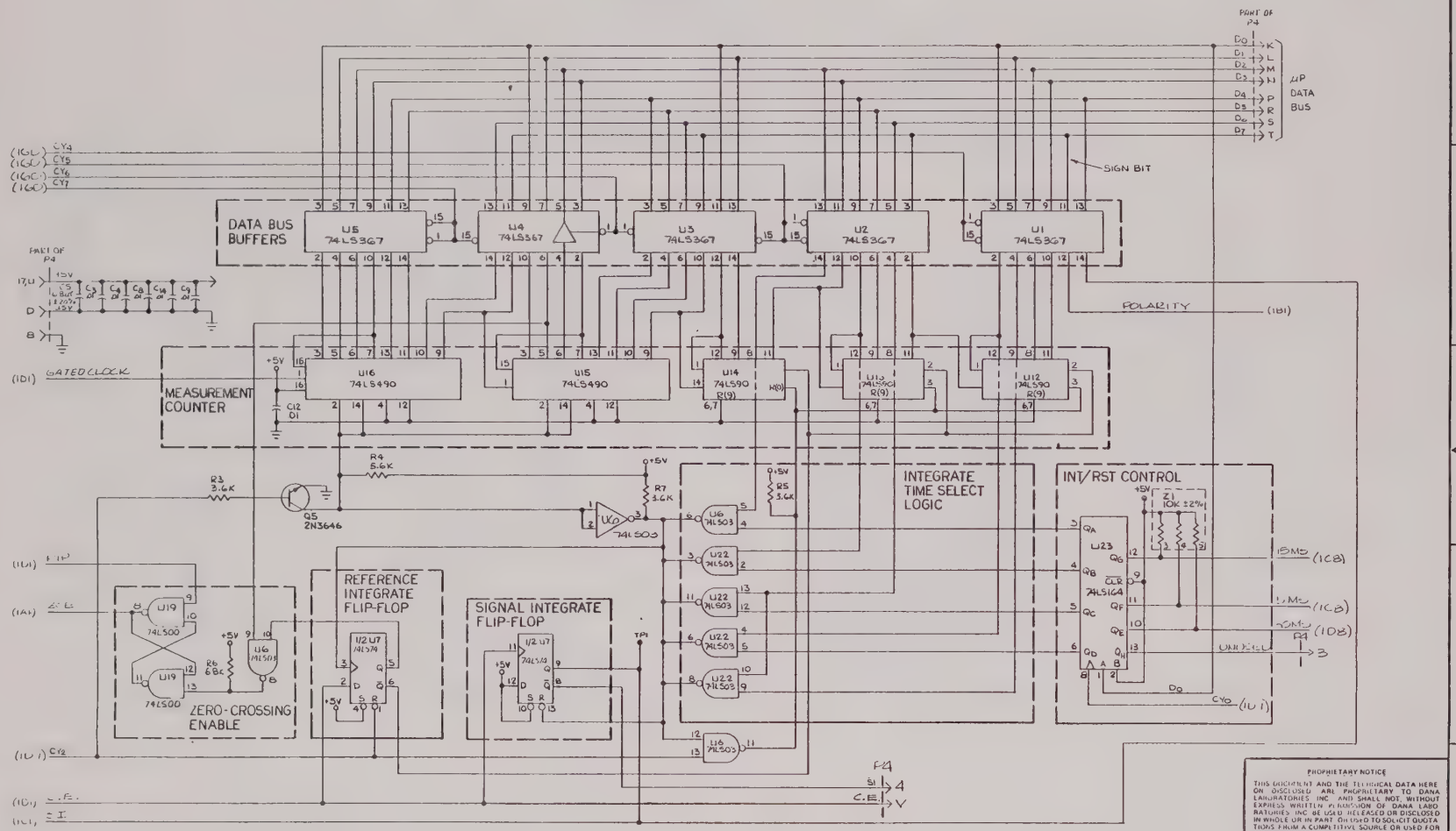
DESIGNATIONS

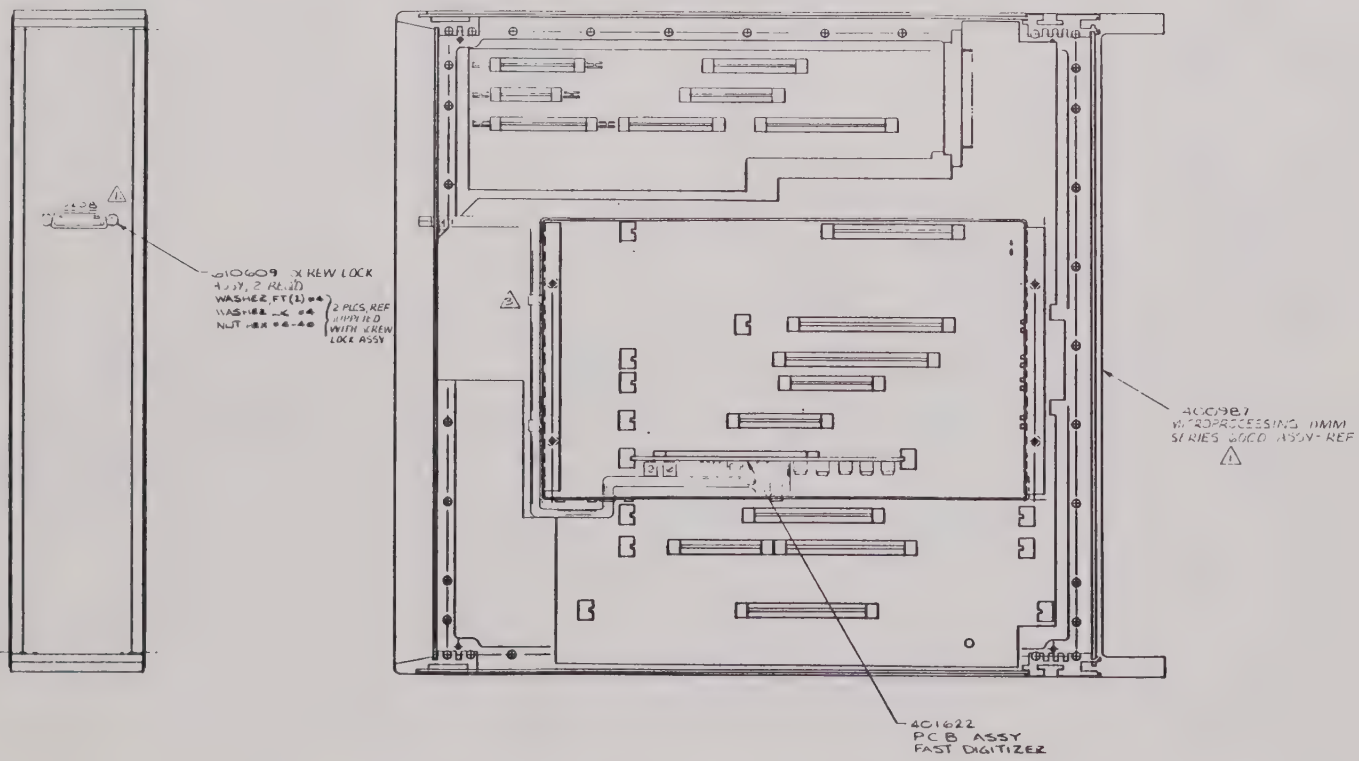
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SCHEMATIC–
CONTROL LOGIC

SIZE	CODE IDENT NO	DWG NO.	REV
D	21793	431604	D

SCALE | SHEET 1 OF 7


DATA BUS BUFFERS
U5 74LS367
U4 74LS367
U3 74LS367
U2 74LS367
U1 74LS367
SIGN BIT
PART OF P4
μP DATA BUS
POLARITY
MEASUREMENT COUNTER
U16 74LS490
U15 74LS490
U14 74LS490
U13 74LS490
U12 74LS490
GATED CLOCK
INTEGRATE TIME SELECT LOGIC
INT/RST CONTROL
U23 74LS164
REFERENCE INTEGRATE FLIP-FLOP
SIGNAL INTEGRATE FLIP-FLOP
ZERO-CROSSING ENABLE
Q5 2N3646
R3 3.6K
R4 5.6K
R5 3.6K
R6 68K
R7 3.6K
Z1 10K ±2%
U6 74LS03
U22 74LS03
U16 74LS03
U19 74LS00
U2 U7 74LS74
U2 U7 74LS13
P4
S1
C.E.
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SIZE D
CODE IDENT NO 21793
DWG NO. 431604
REV D
SCALE
SHEET 2 OF 2
NOTES UNLESS OTHERWISE SPECIFIED



NOTES: UNLESS OTHERWISE SPECIFIED

1. REMOVE BUTCH PLATE (CIBA) BEFORE MTG CONNECTOR
2. ROUTE CABLE THRU EXISTING CLAMPS (010491) ON 454177 SHIELD
3. ASSEMBLE PER DANA WORKMANSHIP MANUAL
4. COVERS AND OTHER PCB ASSY'S NOT SHOWN FOR CLARITY

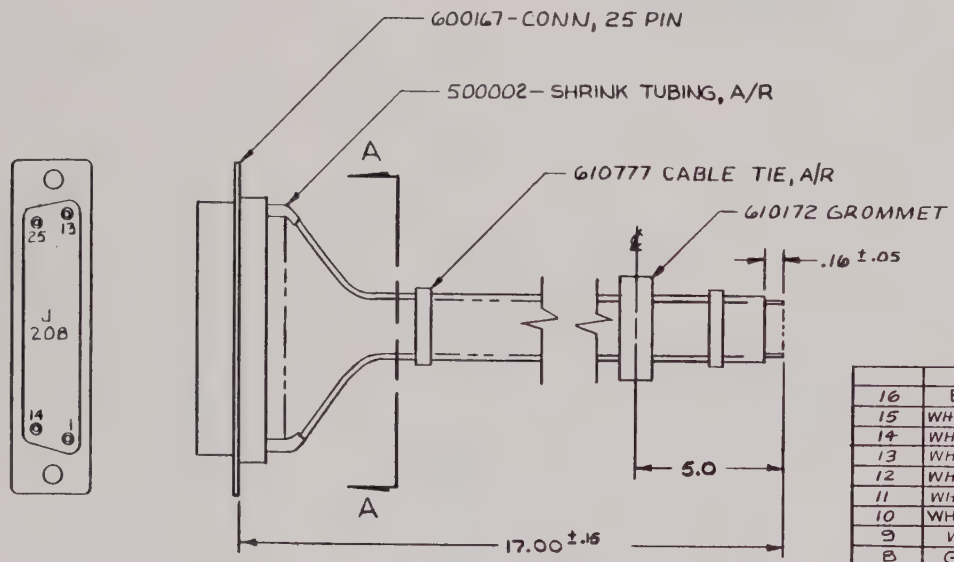
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FAST DIGITIZER
OPTION ASSY

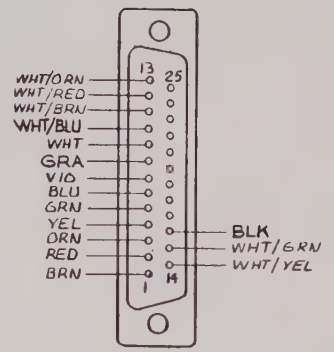
SIZE	CAGE IDENT NO	DWG NO	REV
D	21793	4C4021	B

SCALE — SHEET OF 2



J208 PIN #	COLOR	PART NO.
16	BLK	524000
15	WHT/GRN	524959
14	WHT/YEL	524949
13	WHT/ORN	524939
12	WHT/RED	524929
11	WHT/BRN	524919
10	WHT/BLU	524969
9	WHT	524999
8	GRA	524888
7	VIO	524777
6	BLU	524666
5	GRN	524555
4	YEL	524444
3	ORN	524333
2	RED	524222
1	BRN	524111

WIRE LIST



VIEW A-A
SCALE 2/1

2. TAG & IDENTIFY WITH DANA P/N & CURRENT REV LTR.
1. ASSY PROCESSES & PROCEDURES TO CONFORM TO DANA WORK. STDS.
NOTES. UNLESS OTHERWISE SPECIFIED

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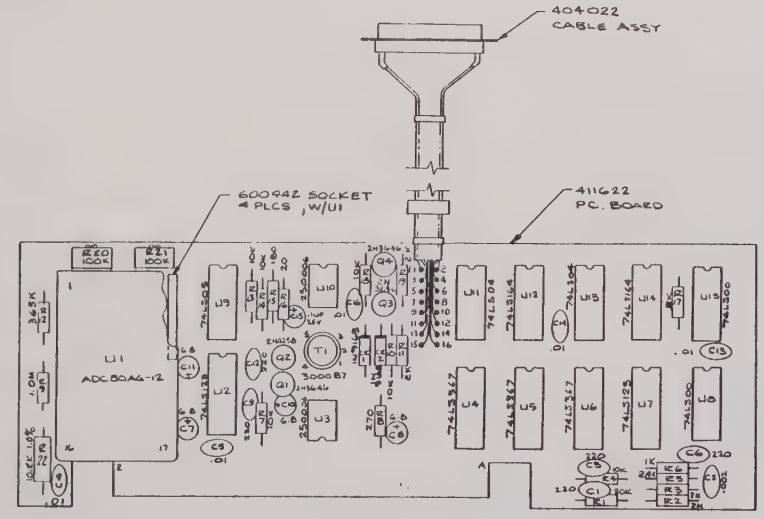
CABLE ASSEMBLY- FAST DIGITIZER

SIZE	CODE IDENT NO	DWG NO	REV
C	21793	404022	A

SCALE 2:1 SHEET 1 OF 2

747

7-48



COMPONENT SIDE SHOWN

CABLE COLORS		
REF DES	COLOR	20B PIN NO
E1	YEL	4
E2	GRN	5
E3	ORN	3
E4	BLU	6
E5	RED	2
E6	VIO	7
E7	BRN	1
E8	GRA	8
E9	WHT/GRN	15
E10	WHT	9
E11	WHT/YEL	14
E12	WHT/BLU	10
E13	WHT/RED	12
E14	WHT/BRN	11
E15	WHT/ORN	13
E16	BLK	16

4 CAPACITORS ARE IN MF
3 RESISTORS ARE IN OHMS, 5%, 1/4W, CC.
2 REF SCHEMATIC NO 421622.
1 ASSY PROCESSES AND PROCEDURES TO CONFORM TO DANA WORKMANSHIP STANDARDS MANUAL.

NOTES: UNLESS OTHERWISE SPECIFIED

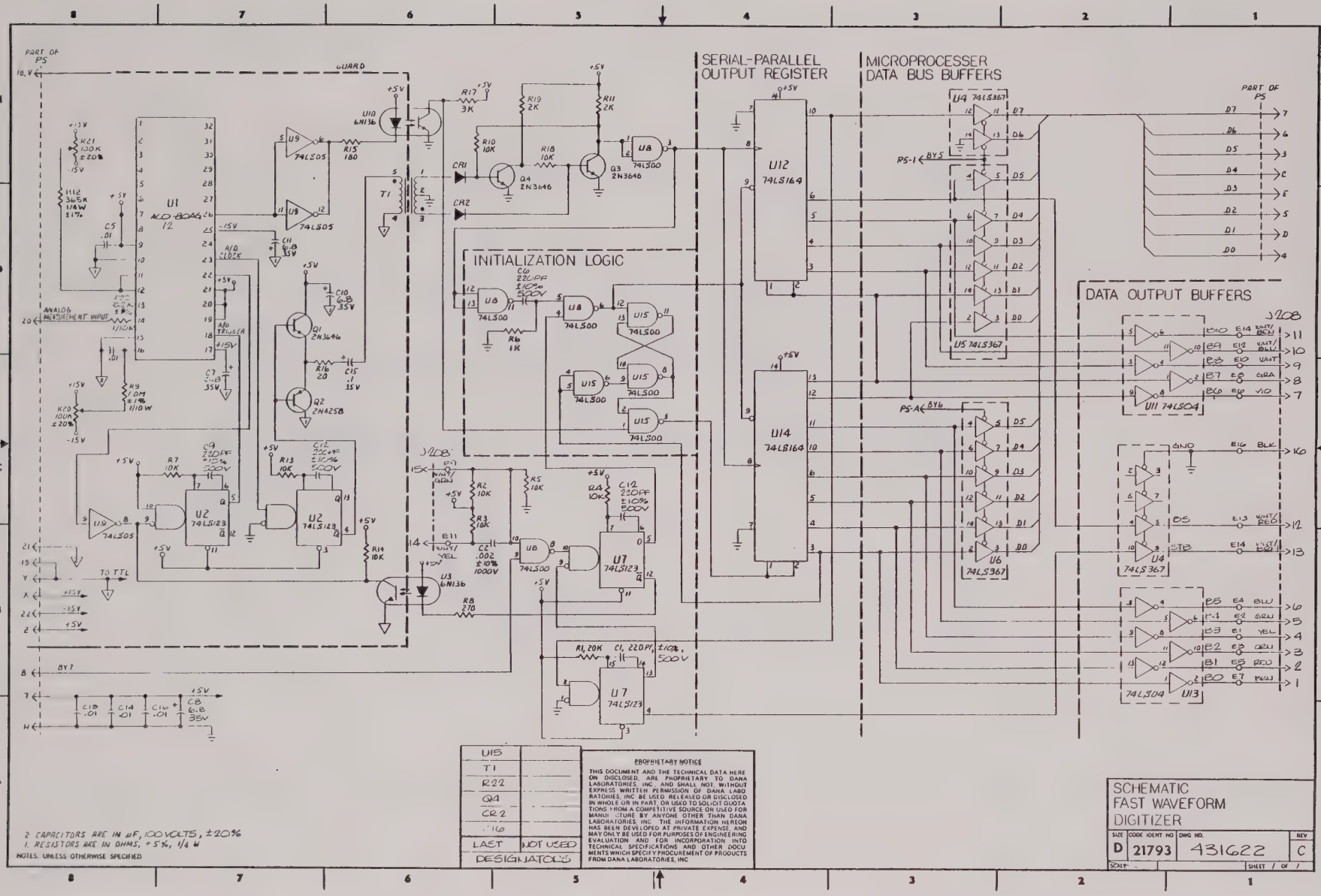
PROPRIETARY NOTICE

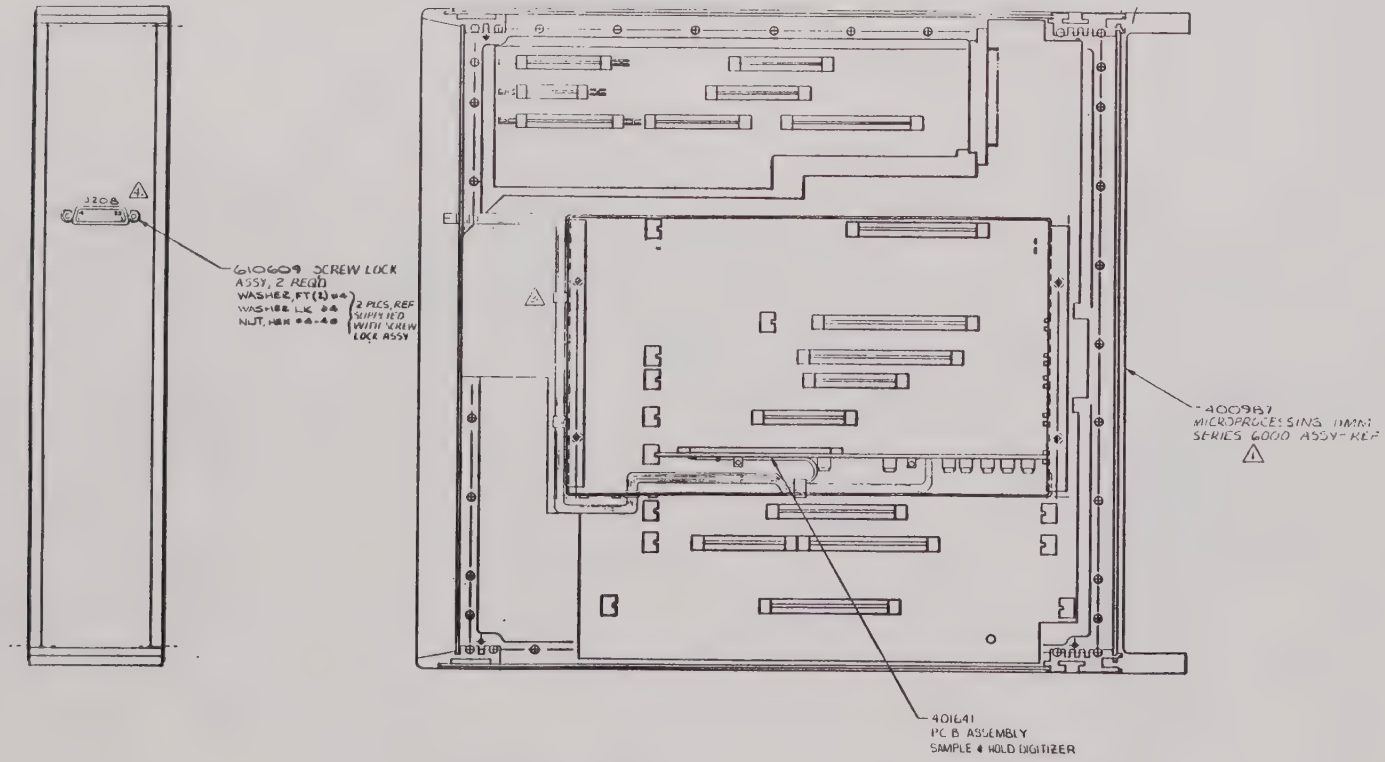
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P.C. BOARD ASSEMBLY
FAST WAVEFORM
DIGITIZER

SIZE	CODE IDENT NO	DWG NO.	REV
D	21793	401622	J

SCALE: 2/1 SHEET 1 OF 3


SERIAL-PARALLEL OUTPUT REGISTER
MICROPROCESSER DATA BUS BUFFERS
INITIALIZATION LOGIC
DATA OUTPUT BUFFERS
GUARD
PART OF PS
ANALOG MEASUREMENT INPUT
TO TTL
U1 KD-BOARD 12
U12 74LS164
U14 74LB164
U5 74LS367
U6 74LS367
U4 74LS367
U11 74LS04
U13 74LS04
U15 74LS00
U7 74LS123
U2 74LS123
U3 6N136
U10 6N136
Q1 2N3646
Q2 2N4258
Q3 2N3646
Q4 2N3646
T1
CR1
CR2
J208
PS-1
PS-A
BY5
BY6
BY7
SCHEMATIC
FAST WAVEFORM
DIGITIZER
SIZE D
CODE IDENT NO 21793
DWG NO. 431622
REV C
SCALE
SHEET 1 OF 1
U15
T1
R22
Q4
CR2
LAST DESIGNATOR USED
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2 CAPACITORS ARE IN uF, 100 VOLTS, ±20%
1. RESISTORS ARE IN OHMS, ±5%, 1/4 W
NOTES: UNLESS OTHERWISE SPECIFIED


J208
610609 SCREW LOCK ASSY, 2 REQD
WASHER, FT (2) #4
WASHER LK #4
NUT, HEX #4-40
2 PLCS, REF SHIPPED WITH SCREW LOCK ASSY
400987 MICROPROCESSING UNIT SERIES 6000 ASSY-REF
401641 PC B ASSEMBLY SAMPLE & HOLD DIGITIZER

NOTES: UNLESS OTHERWISE SPECIFIED

⚠ REMOVE BUTCH PLATE 434184 BEFORE MTG. CONNECTOR J208
⚠ ROUTE CABLE THRU EXISTING CLAMPS (610491) ON 434177 SHIELD
⚠ ASSEMBLE PER RACAL DANA WORKMANSHIP MANUAL.
⚠ COVERS AND OTHRE P.C.B ASSY'S NOT SHOWN FOR CLARITY

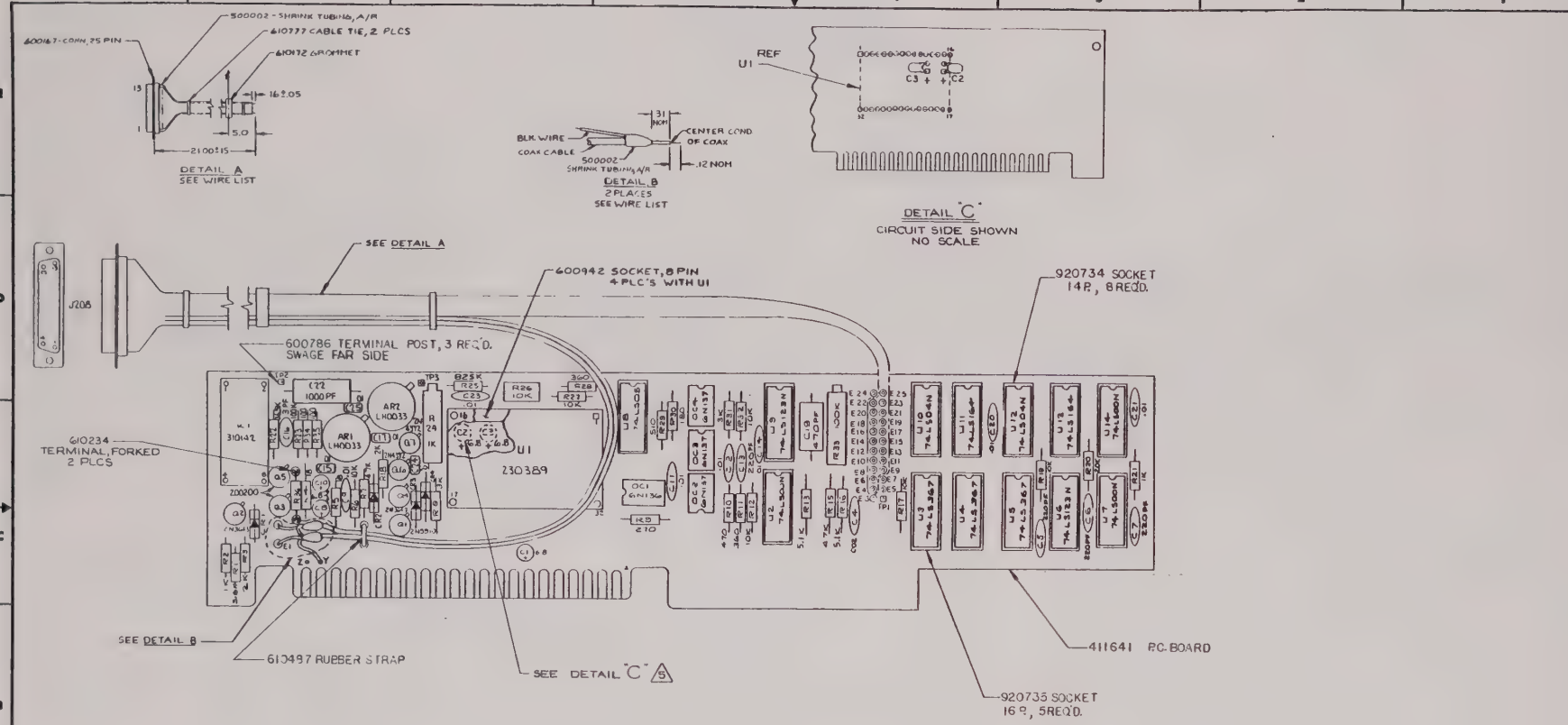
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SAMPLE AND HOLD DIGITIZER ASSEMBLY- OPTION 03

SIZE	CODE IDENT NO	DWG NO	REV
D	21793	404059	A

SCALE: NONE SHEET 1 OF 2



5 INSTALL C2 AND C3 ON CIRCUIT SIDE. BEND CAPS OVER. SEE DETAIL C.

4 ALL DIODES ARE IN916B.

3 ALL CAPACITORS ARE IN MFD.

2 REFERENCE SCHEMATIC NO. 432641.

1. ASSEMBLY PROCESSES & PROCEDURES TO CONFORM TO DANA WORKMANSHIP STANDARDS.

NOTES UNLESS OTHERWISE SPECIFIED

PROPRIETARY NOTICE

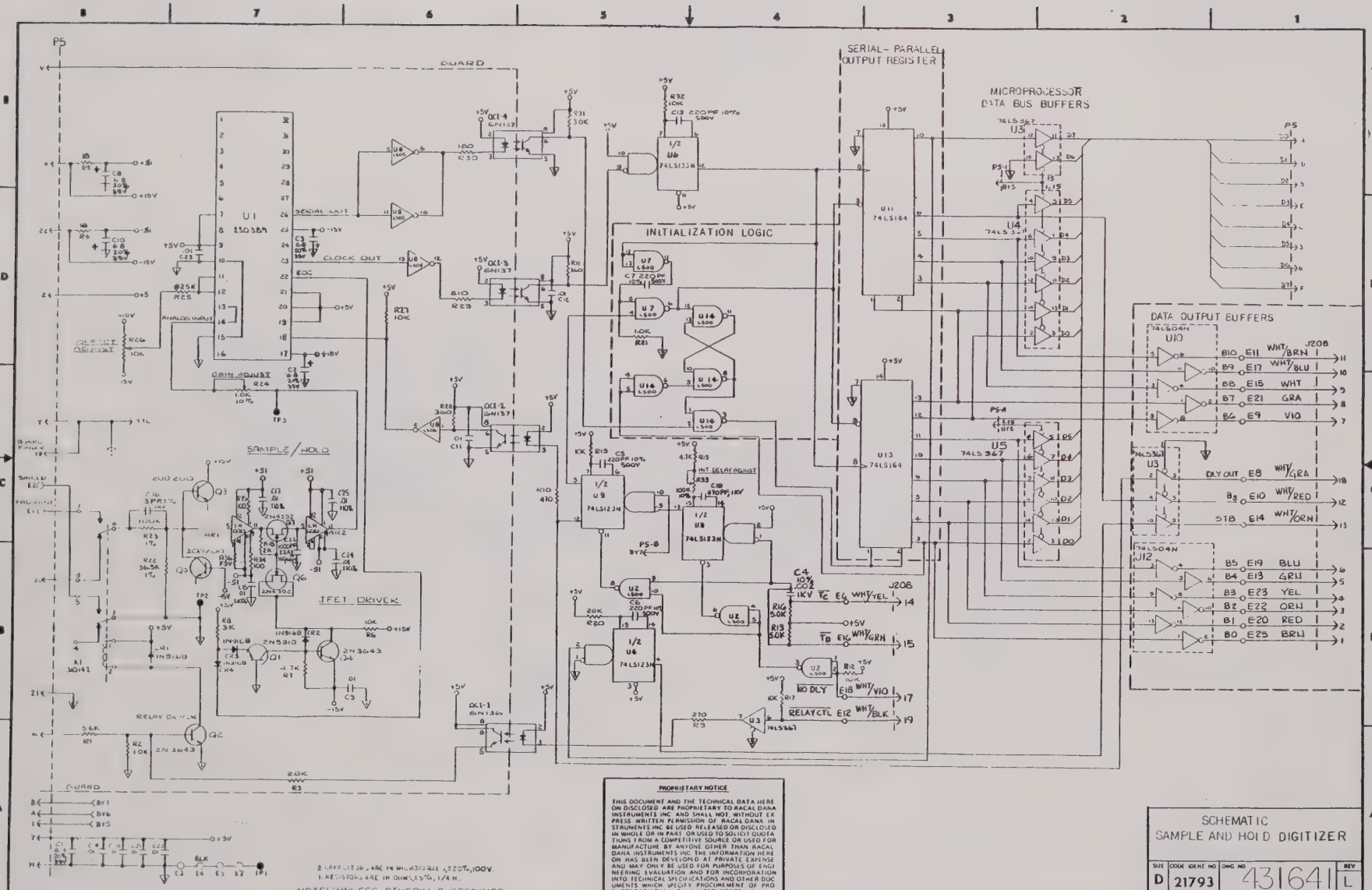
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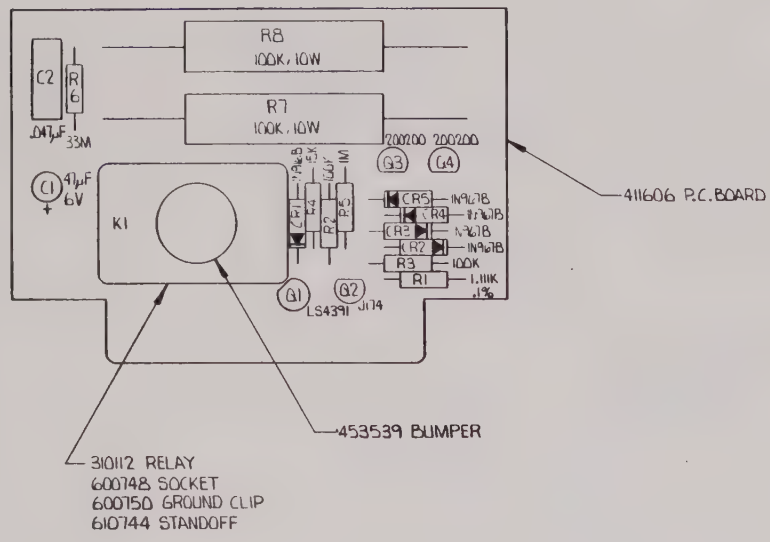
P.C. BOARD ASSEMBLY
SAMPLE AND HOLD DIGITIZER

SIZE	CODE IDENT NO	DWG NO	REV
D	21793	401641	S

SCALE | SHEET 1 OF 7

7-51


GUARD
SERIAL- PARALLEL OUTPUT REGISTER
MICROPROCESSOR DATA BUS BUFFERS
INITIALIZATION LOGIC
DATA OUTPUT BUFFERS
SAMPLE/HOLD
FET DRIVER
RELAY DRIVER
U1 2301389
U11 74LS164
U13 74LS164
U3 74LS367
U4 74LS367
U5 74LS367
U10 74LS04N
U12 74LS04N
U9 74LS123N
U6 74LS123N
U8 74LS123N
P5
J208
SERIAL OUT
CLOCK OUT
EOC
ANALOG INPUT
OFFSET ADJUST
GAIN ADJUST
INT DELAY ADJUST
DLY OUT
NO DLY
RELAYCTL
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NOTES: UNLESS OTHERWISE SPECIFIED
1. CAPACITORS ARE IN MICROFARADS, ±20%, 100V.
2. RESISTORS ARE IN OHMS, ±5%, 1/4 W.
SCHEMATIC
SAMPLE AND HOLD DIGITIZER
SIZE D
CODE IDENT NO 21793
DWG NO 431641
REV L
SCALE
SHEET 1 OF 1



2. SCHEMATIC REFERENCE 431606.
1. ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM TO DANA WORKMANSHIP MANUAL.

NOTES: UNLESS OTHERWISE SPECIFIED

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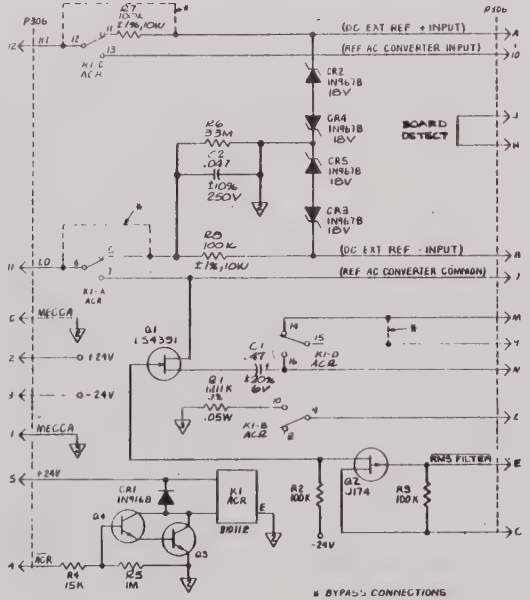
NOTES: UNLESS OTHERWISE SPECIFIED

P.C. BOARD ASSEMBLY
RATIO SWITCHING

SIZE	CODE IDENT NO	DWG NO	REV
C	21793	401606	B

SCALE 2/1 SHEET OF 2

7553



CR5	
Q3	
K1	
C2	
R5	
LAST USED	NOT USED

EQUIVALENTS

PROPRIETARY NOTICE

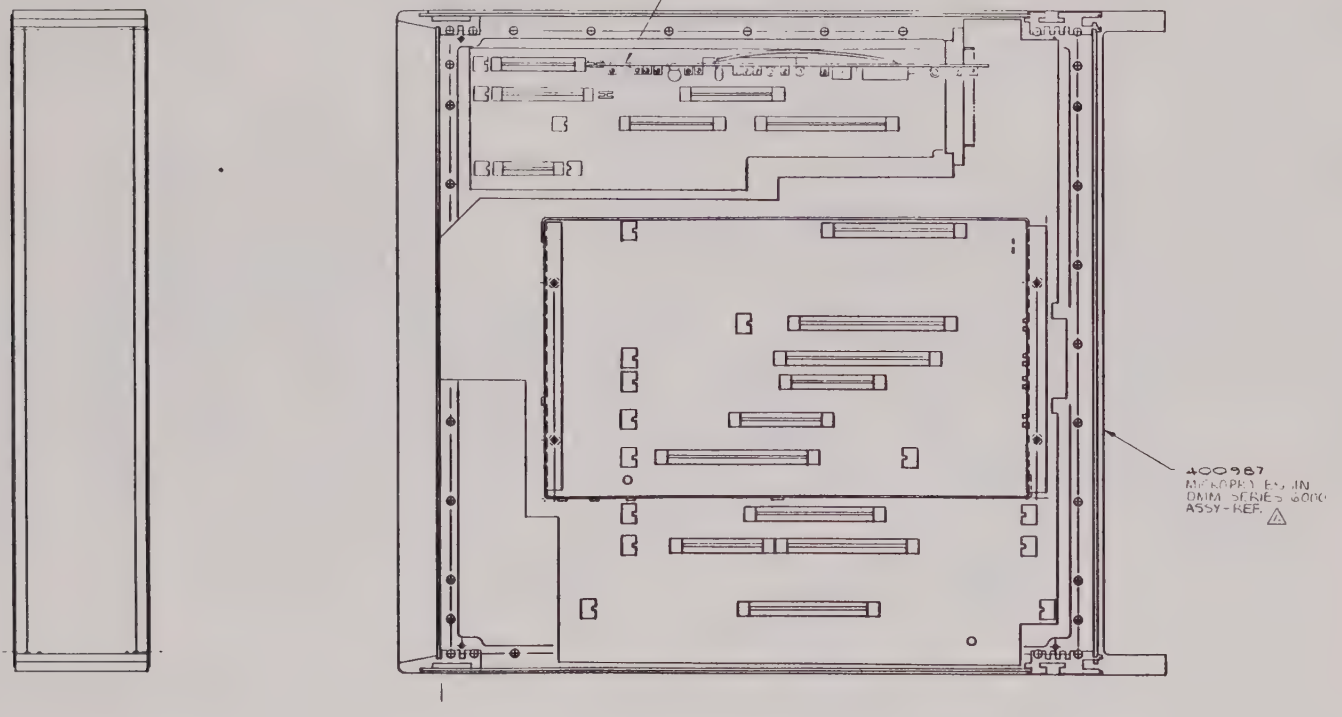
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NOTES UNLESS OTHERWISE SPECIFIED
1 TRANSISTORS ARE 2N2DDD
2 RESISTORS ARE IN OHMS, ±5%, 1/4W
3 CAPACITORS ARE IN MICROFARADS

SCHEMATIC - RATIO SWITCHING

SIZE	CODE IDENT NO	DWG NO	REV
D	21793	431606	A

SCALE NONE | SHEET 1 OF 1



PROPRIETARY NOTICE

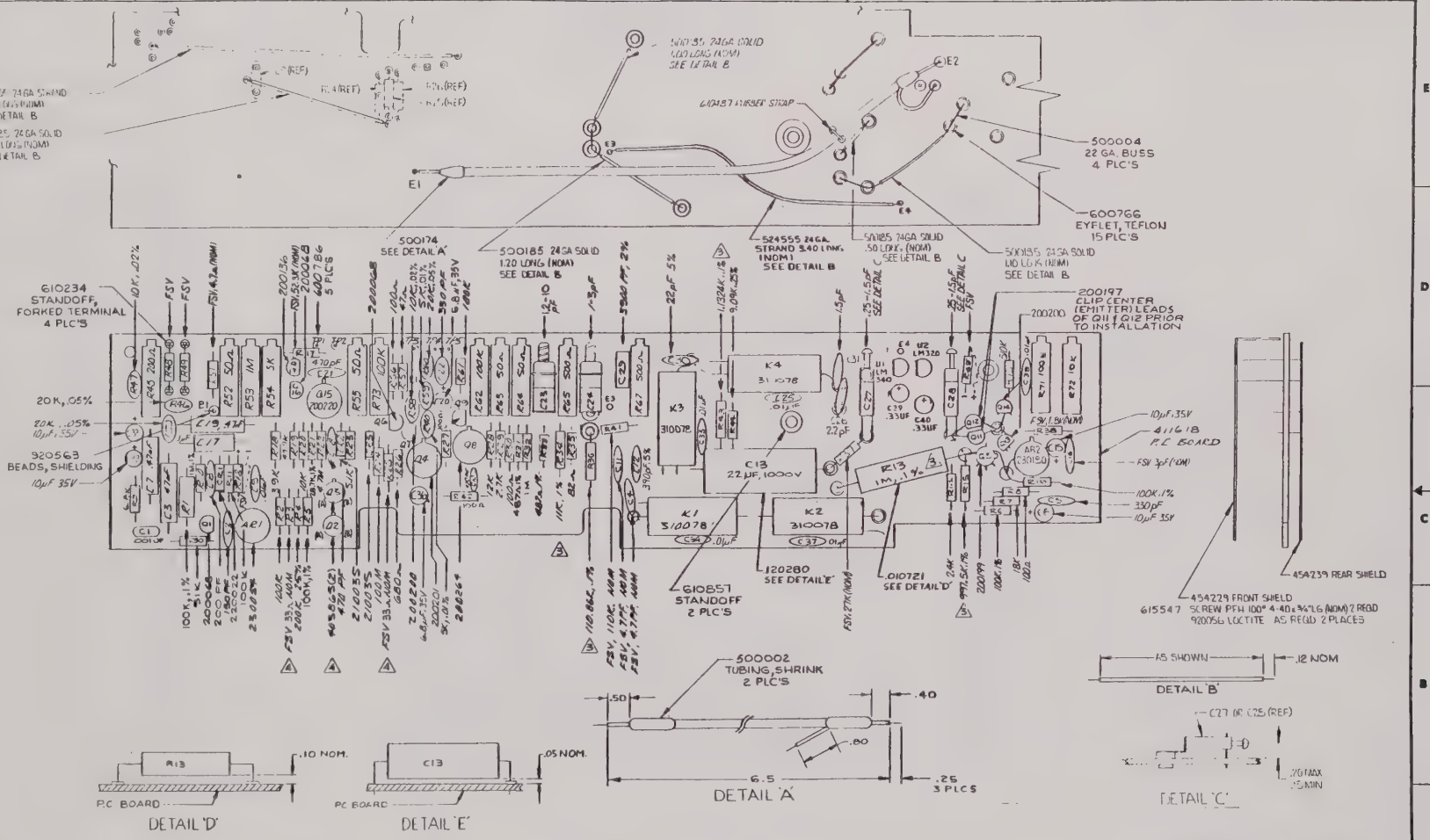
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3 ASSEMBLE PER DANA WORKMANSHIP MANUAL
(1) COVERS AND OTHER PCB ASSYS NOT SHOWN FOR CLARITY
NOTES UNLESS OTHERWISE SPECIFIED

RMS CONVERTER
OPTION ASSY

SIZE	CODE IDENT NO	DWG NO	REV
D	21793	404C27	A

SCALE — SHEET OF


524555 24GA STRAND 5.40 LONG (NOM) SEE DETAIL B
500185 24GA SOLID 1.60 LONG (NOM) SEE DETAIL B
500187 24GA SOLID 4.00 LONG (NOM) SEE DETAIL B
610187 PURSE STRAP
500004 22 GA. BUSS 4 PLC'S
600766 EYELET, TEFLON 15 PLC'S
500174 SEE DETAIL 'A'
500185 24GA SOLID 1.20 LONG (NOM) SEE DETAIL B
524555 24GA. STRAND 5.40 LONG (NOM) SEE DETAIL B
500185 24GA SOLID .50 LONG (NOM) SEE DETAIL B
500187 24GA SOLID 4.00 LONG (NOM) SEE DETAIL B
610234 STANDOFF, FORKED TERMINAL 4 PLC'S
600786 5 PLC'S
200197 CLIP CENTER (EMITTER) LEADS OF Q11 & Q12 PRIOR TO INSTALLATION
200200
20K, .05%
920563 BEADS, SHIELDING
10µF 35V
K1 310078
K2 310078
K3 310078
K4 31 1078
C13 22µF, 1000V
610857 STANDOFF 2 PLC'S
120280 SEE DETAIL 'E'
010721 SEE DETAIL 'D'
4116 18 P.C. BOARD
100K 1%
330pF
459239 REAR SHIELD
459229 FRONT SHIELD
615547 SCREW PFH 100° 4-40 x 3/16 LG (NOM) 2 REQD
920056 LOCTITE AS REQ'D 2 PLACES
500002 TUBING, SHRINK 2 PLC'S
DETAIL 'A'
DETAIL 'B'
DETAIL 'C'
DETAIL 'D'
DETAIL 'E'
P.C. BOARD

A) Q2, Q3, R3 AND R25 ARE FACTORY MATCHED TRANSISTOR KIT 401865.
R13, R15, R34, R36 AND R43 ARE RESISTOR SET 010721.

2. REF SCHEMATIC 4316 18

1. ASSY PROCESSES & PROCEDURES TO CONFORM TO DANA WORKMANSHIP STANDARDS

NOTES: UNLESS OTHERWISE SPECIFIED

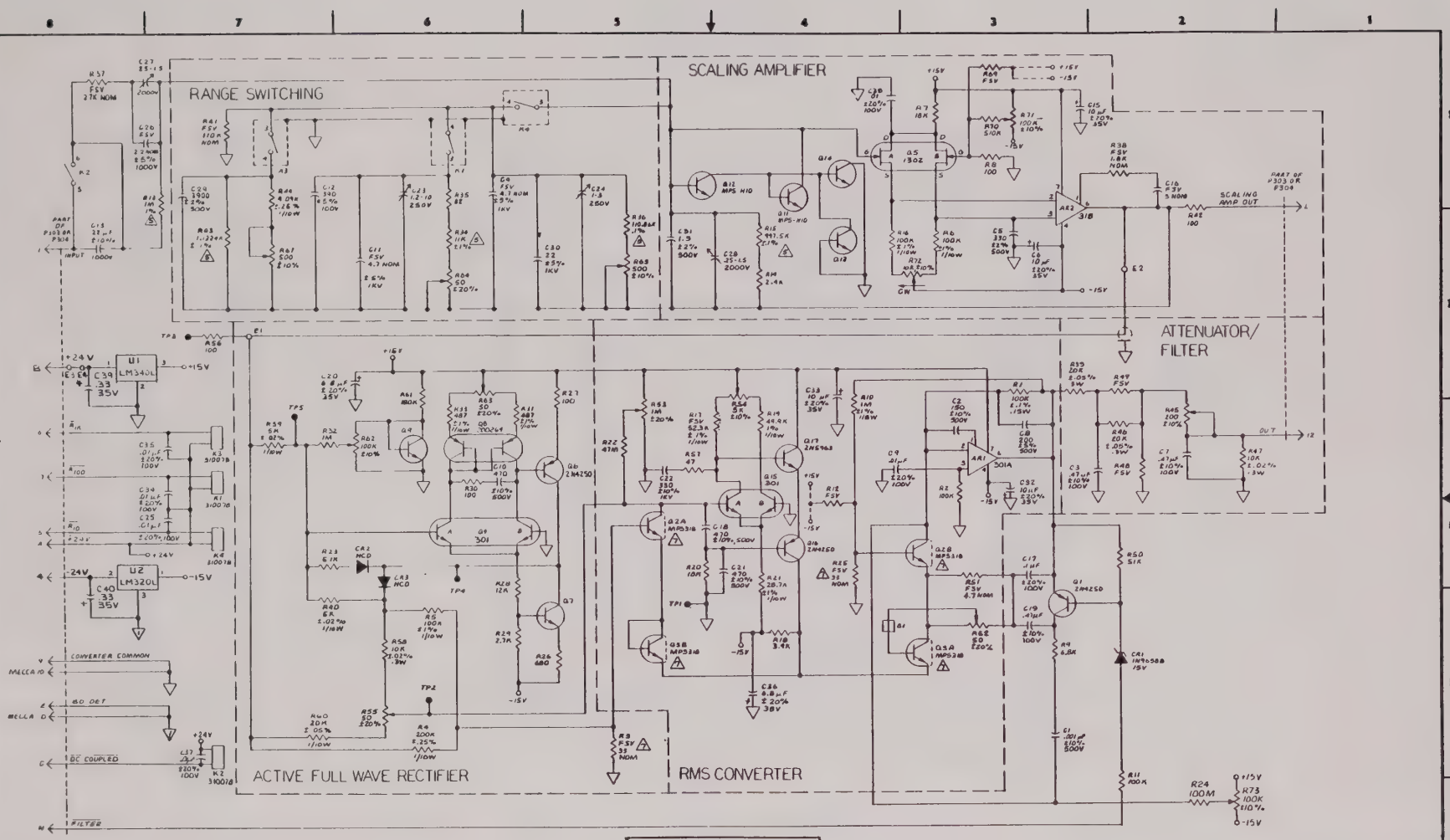
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DANA LABORATORIES INC.
IRVINE, CALIFORNIA

PC CARD ASSY
RMB CONVERTER

SIZE	CODE IDENT NO	DWG NO	REV
D	21793	4016 18	K

SCALE — SHEET 1 OF 3



⚠2, Q3, A3, AND R25 ARE LOGIC TRANSISTOR KIT 403865

⚠5 R15, R15, A34, R36, AND R43 ARE RESISTOR SET 010721

4. TRANSISTORS ARE 2002CD
3. DIODES ARE IN916B
2. CAPACITORS ARE IN pF
1. RESISTORS ARE IN OHMS, ±5%, ¼W

NOTES. UNLESS OTHERWISE SPECIFIED

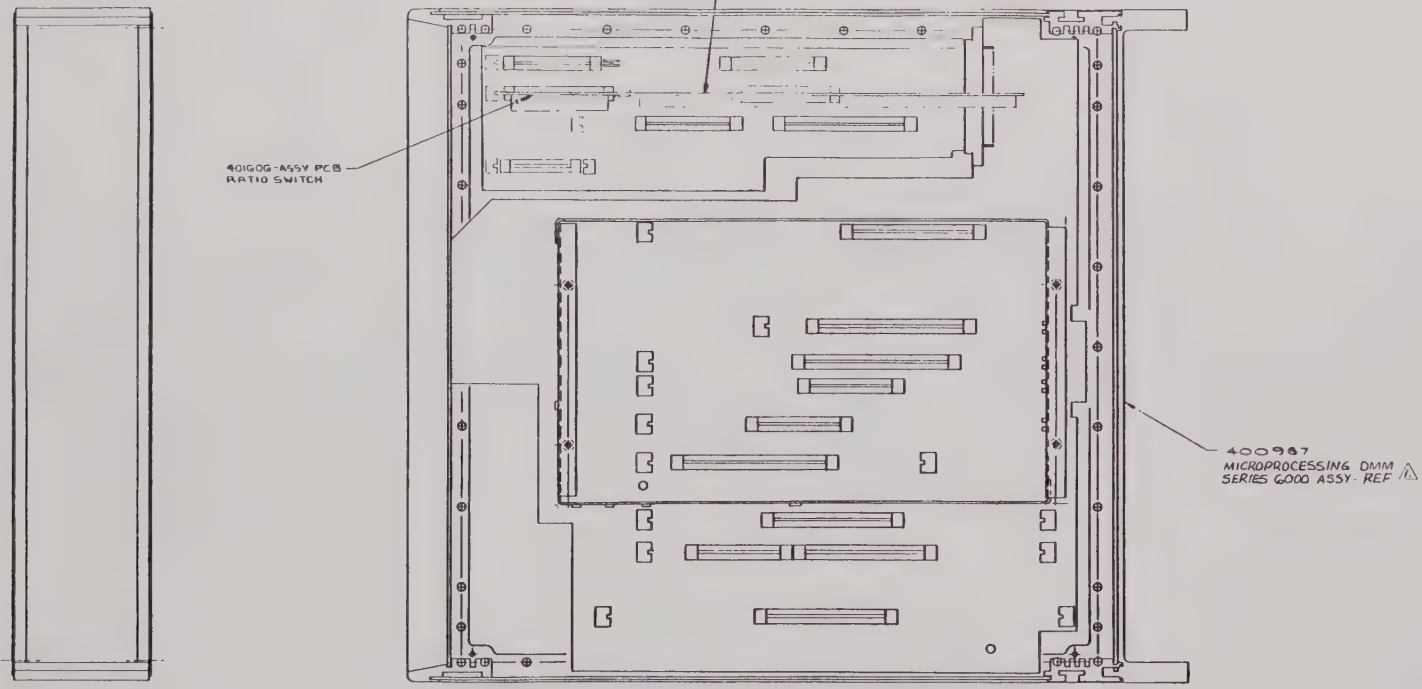
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SCHEMATIC-
RMS CONVERTER

SIZE	CODE IDENT NO	DWG NO.	REV
D	21793	431618	D

SCALE | SHEET 1 OF 1



⚠ ASSEMBLE PER DANA WORKMANSHIP MANUAL
⚠ COVERS AND OTHER PC.B ASSY'S NOT SHOWN FOR CLARITY.

NOTES UNLESS OTHERWISE SPECIFIED

PROPRIETARY NOTICE

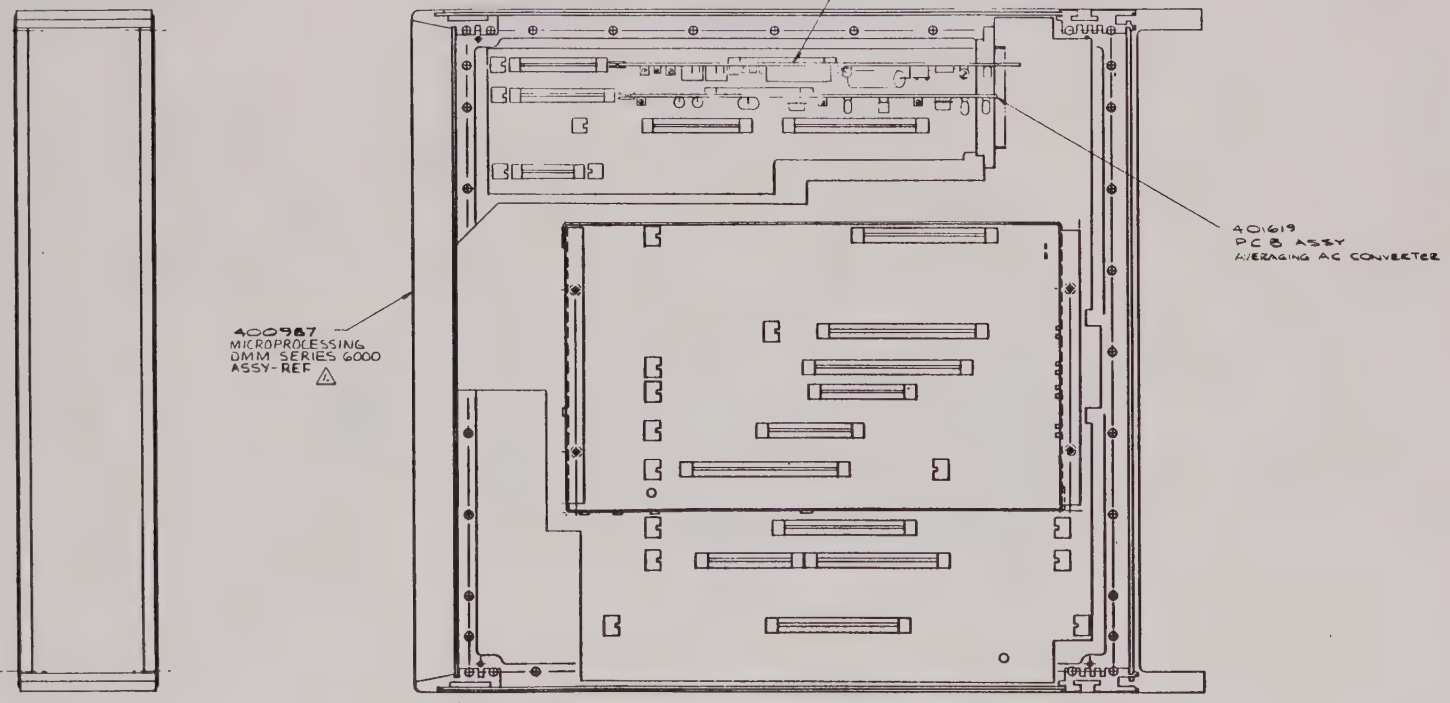
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AC RATIO
OPTION ASSY

SIZE	CODE IDENT NO	DWG NO	REV
D	21793	404026	E

SCALE FT

SHEET 1 OF 2



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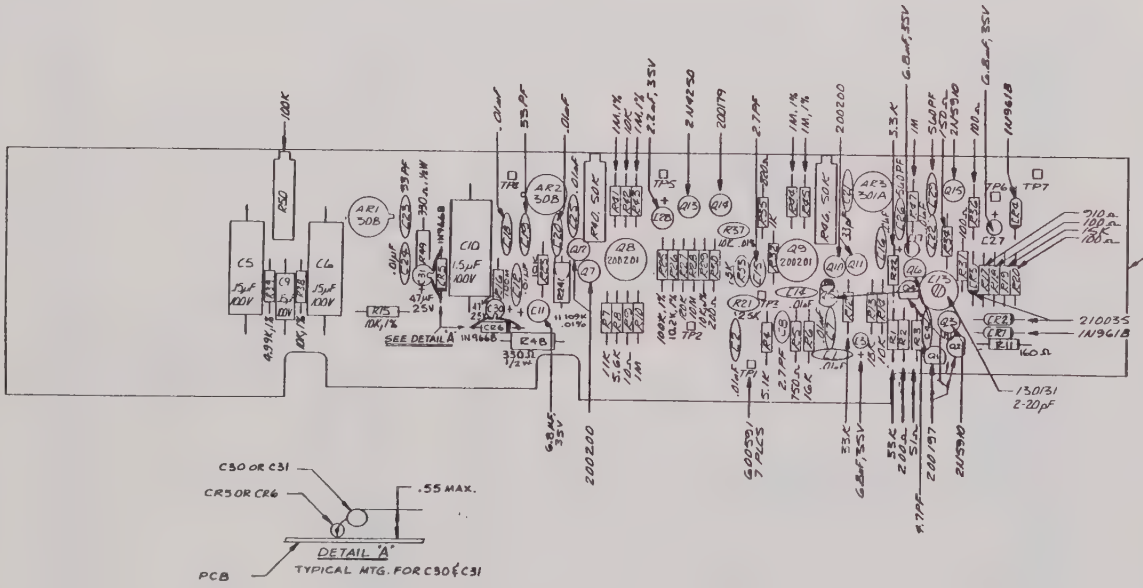
AC CONVERTER GROUP
OPTION ASSY

SIZE	CODE IDENT NO	DWG NO	REV
D	21793	404028	A

SCALE | SHEET 1 OF 2

⚠ ASSEMBLE PER DANA INSTRUMENTS MANUAL
⚠ COVERS AND OTHER P.C.B. ASSY'S NOT SHOWN FOR CLARITY.

NOTES: UNLESS OTHERWISE SPECIFIED



2. REF. SCHEMATIC 431619
1. ASSY. PROCESSES & PROCEDURES TO CONFORM TO DANA WORKMANSHIP STANDARDS.

NOTES UNLESS OTHERWISE SPECIFIED

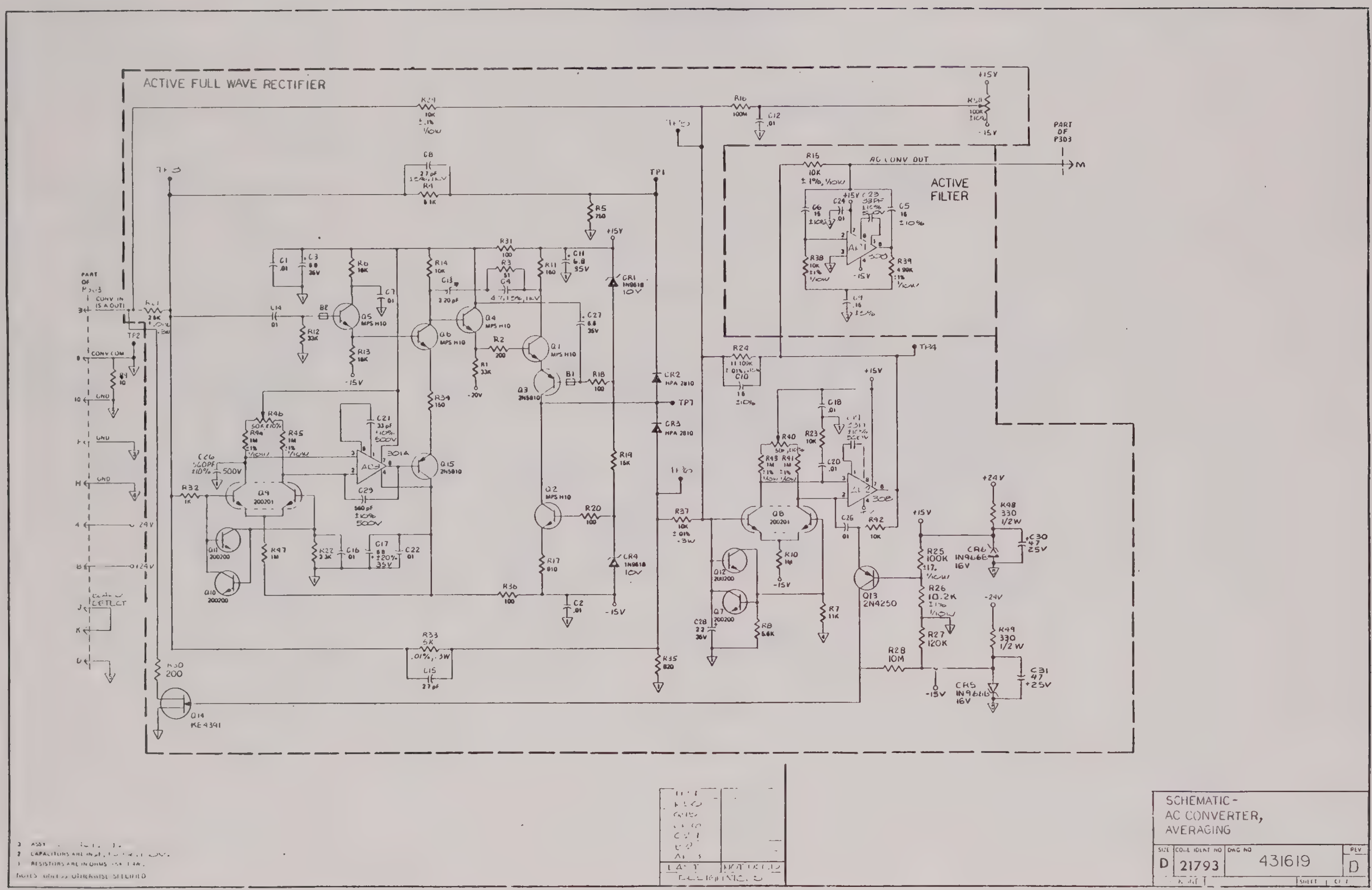
PROPRIETARY NOTICE

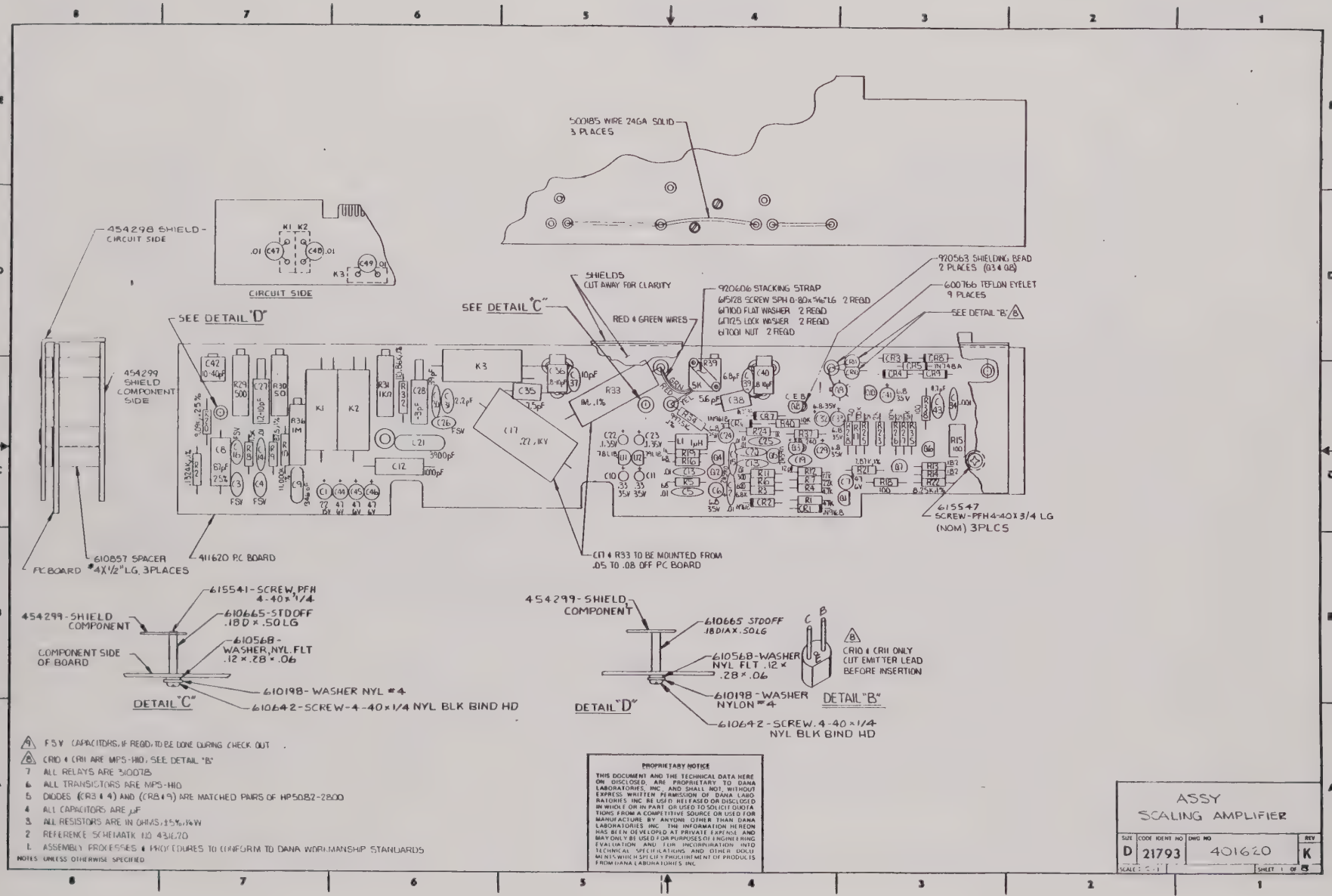
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PCB. ASSY
AVERAGING
AC CONVERTER

SIZE	CODE IDENT NO	DWG NO.	REV
D	21793	411619	F

SCALE 2X1 SHEET 1 OF 6


ACTIVE FULL WAVE RECTIFIER
ACTIVE FILTER
AC CONV OUT
PART OF P303
CONV IN (15 A OUT)
CONV COM
GND
TP1
TP2
TP4
TP7
SCHEMATIC - AC CONVERTER, AVERAGING
SIZE D
CODE IDENT NO 21793
DWG NO 431619
REV D
RESISTORS ARE IN OHMS
NOTES: UNLESS OTHERWISE SPECIFIED


500185 WIRE 24GA SOLID
3 PLACES
454298 SHIELD - CIRCUIT SIDE
CIRCUIT SIDE
SEE DETAIL "D"
454299 SHIELD COMPONENT SIDE
SHIELDS CUT AWAY FOR CLARITY
SEE DETAIL "C"
RED & GREEN WIRES
920606 STACKING STRAP
6M5128 SCREW SPH 0-80×5/16 2 REQD
6M100 FLAT WASHER 2 REQD
6M125 LOCK WASHER 2 REQD
6M001 NUT 2 REQD
920563 SHIELDING BEAD
2 PLACES (B3 & B8)
600766 TEFLON EYELET
9 PLACES
SEE DETAIL "B" 6
615547 SCREW-PFH 4-40 X 3/4 LG (NOM) 3PLCS
610857 SPACER 4X1/2" LG, 3PLACES
PC BOARD
411620 P.C. BOARD
C17 & R33 TO BE MOUNTED FROM .05 TO .08 OFF P.C. BOARD
615541 - SCREW, PFH 4-40 × 1/4
454299 - SHIELD COMPONENT
610665 - STDOFF .18D × .50LG
610568 - WASHER, NYL, FLT .12 × .28 × .06
COMPONENT SIDE OF BOARD
610198 - WASHER NYL #4
610642 - SCREW-4-40 × 1/4 NYL BLK BIND HD
DETAIL "C"
454299 - SHIELD COMPONENT
610665 STDOFF .18DIA X .50LG
610568 - WASHER NYL FLT .12 × .28 × .06
610198 - WASHER NYLON #4
610642 - SCREW. 4-40 × 1/4 NYL BLK BIND HD
DETAIL "D"
C B E
CR10 & CR11 ONLY CUT EMITTER LEAD BEFORE INSERTION
DETAIL "B"

4 FSV CAPACITORS, IF REQD, TO BE DONE DURING CHECK OUT.

6 CR10 & CR11 ARE MPS-H10, SEE DETAIL "B"

7 ALL RELAYS ARE 300178

6 ALL TRANSISTORS ARE MPS-H10

5 DIODES (CR3 & 4) AND (CR8 & 9) ARE MATCHED PAIRS OF HP5082-2800

4 ALL CAPACITORS ARE μF

3 ALL RESISTORS ARE IN OHMS, ±5%, 1/4W

2 REFERENCE SCHEMATIK NO 43L70

1 ASSEMBLY PROCESSES & PROCEDURES TO CONFORM TO DANA WORKMANSHIP STANDARDS

NOTES UNLESS OTHERWISE SPECIFIED

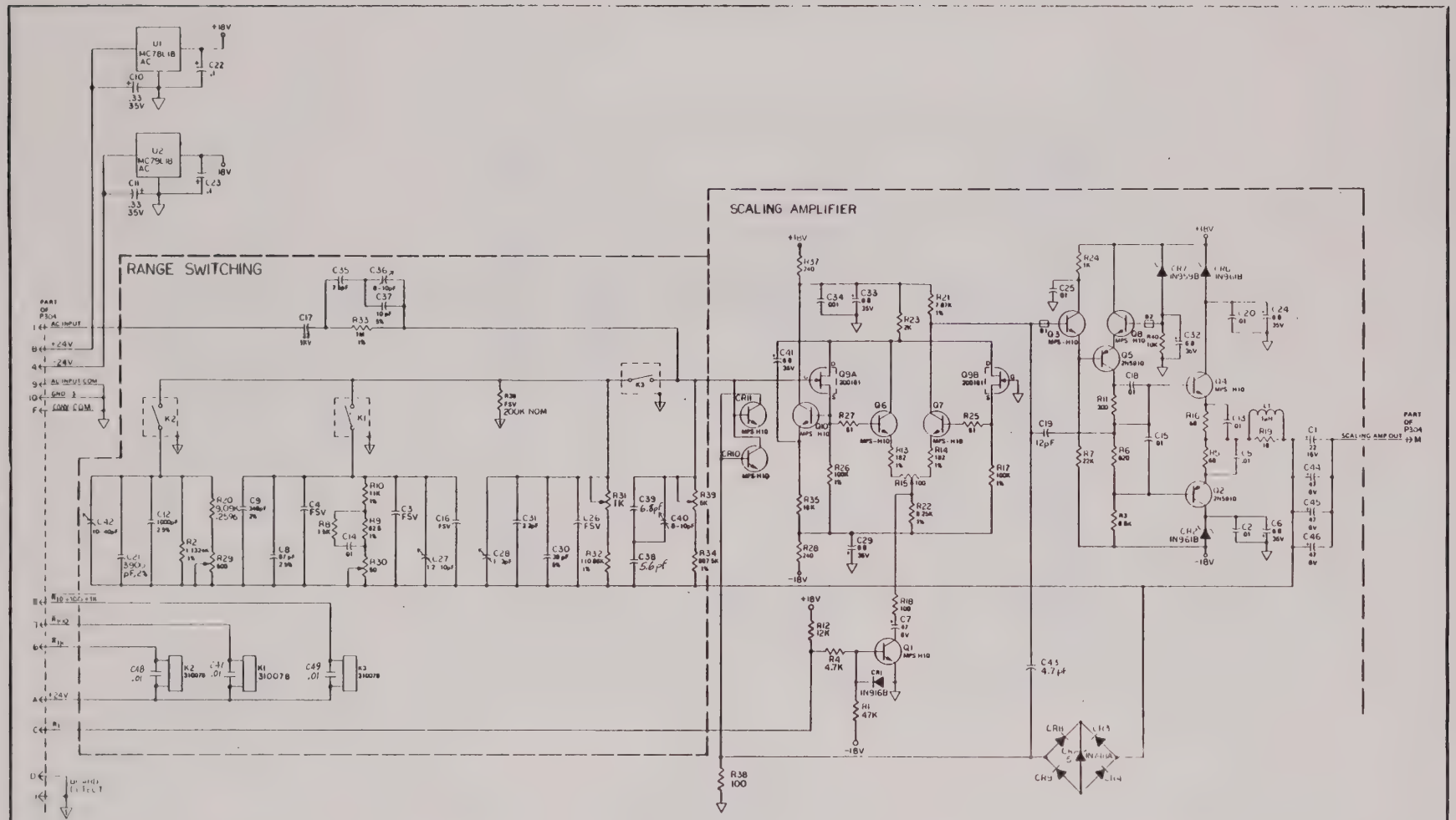
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ASSY
SCALING AMPLIFIER

SIZE	CODE IDENT NO	DWG NO	REV
D	21793	401620	K

SCALE: 2:1 SHEET 1 OF 8

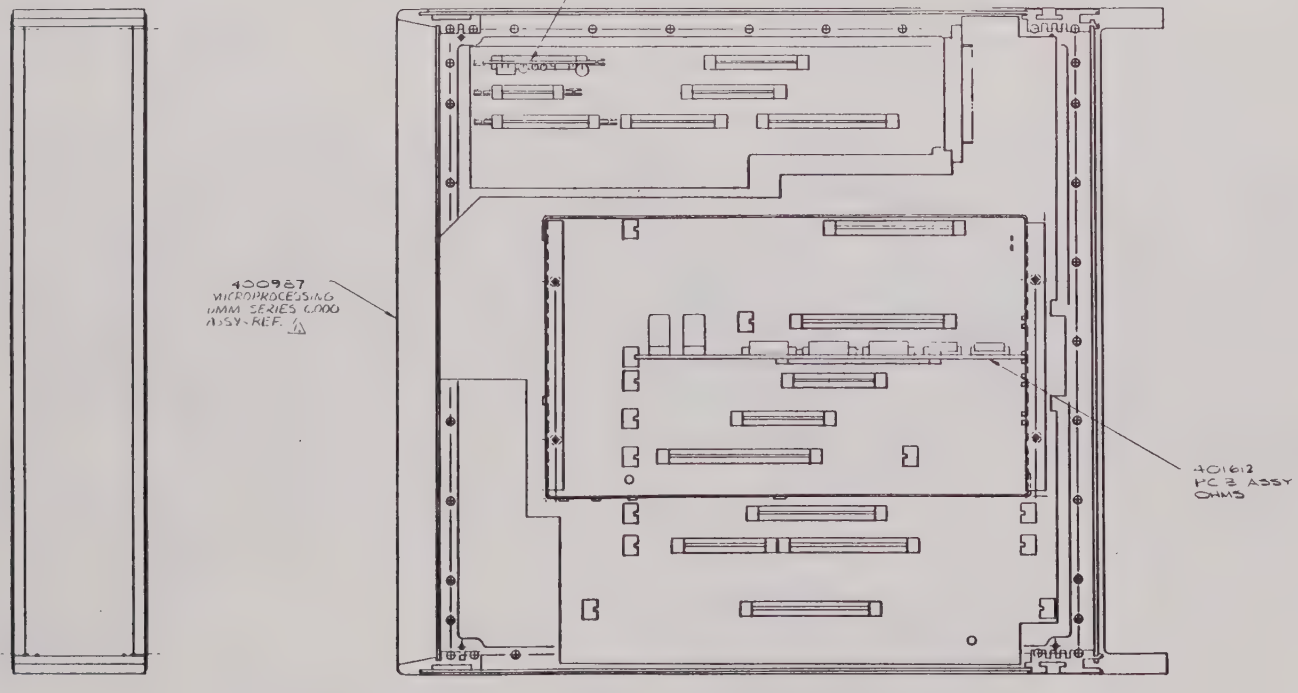


4 CR3-CR6, CR8 AND CR9 ARE MATCHED PAIRS OF HP5082-2800 DIODES
3 ASSEMBLY 401620
2 CAPACITORS ARE IN µF
1 RESISTORS ARE IN OHMS, ±5%, 1/4W
NOTES UNLESS OTHERWISE SPECIFIED

SCHEMATIC – SCALING AMPLIFIER

SIZE	CODE IDENT NO	DWG NO	REV
D	21793	401620	D

SHEET 1 OF 1



1 ASSEMBLE PER DANA WORKMANSHIP MANUAL
VIEWS NO OTHER PCB ASSY'S NOT SHOWN FOR CLARITY

NOTES UNLESS OTHERWISE SPECIFIED

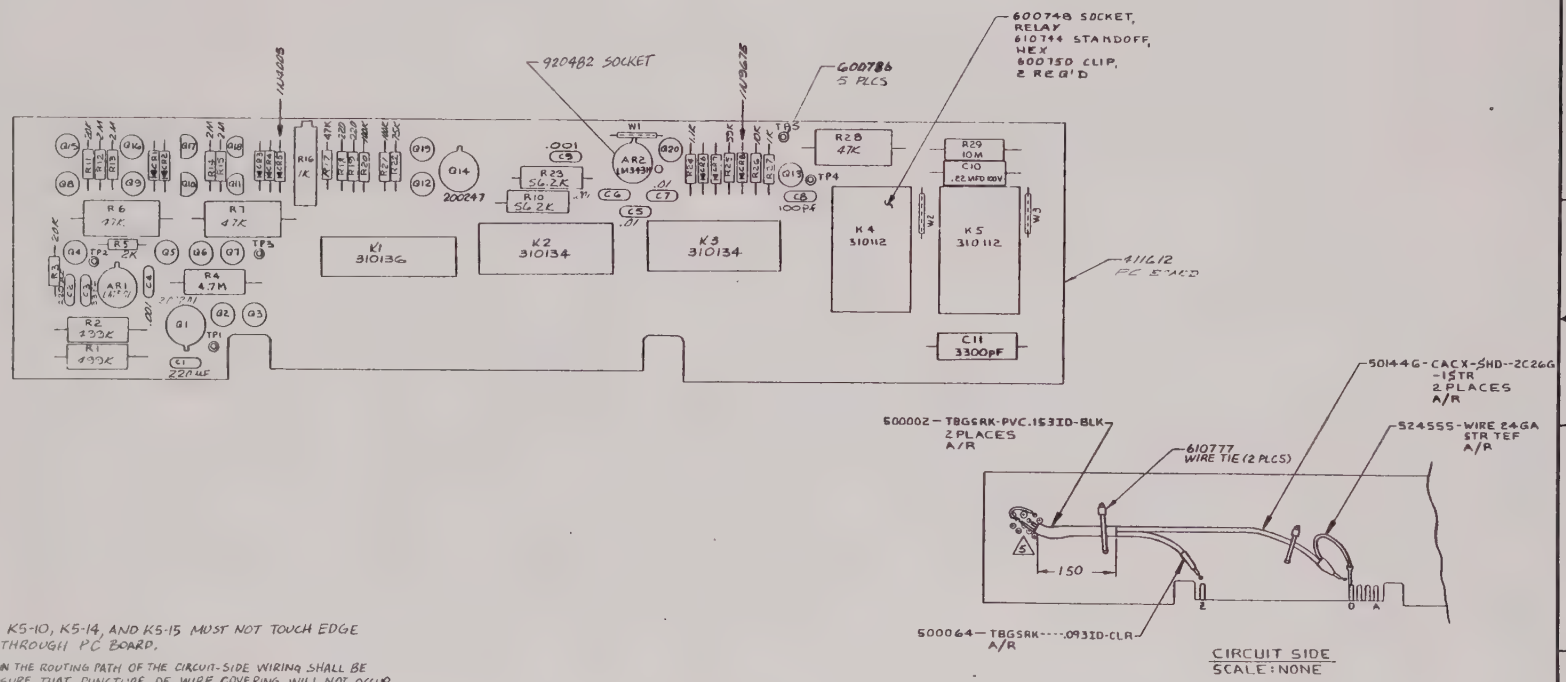
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OHMS OPTION ASSY

SIZE	CODE IDENT NO	DWG NO	REV
D	21793	404C23	B

SCALE — SHEET 1 OF 2



CIRCUIT SIDE
SCALE: NONE

7. SOLDER JOINTS AT K5-10, K5-14, AND K5-15 MUST NOT TOUCH EDGE OF HOLES DRILLED THROUGH PC BOARD.

6. ALL COMPONENT LEADS IN THE ROUTING PATH OF THE CIRCUIT-SIDE WIRING SHALL BE CLIPPED SO AS TO ASSURE THAT PUNCTURE OF WIRE COVERING WILL NOT OCCUR

5 SOLDER SHIELDS TOGETHER BEFORE APPLYING SHRINK SLEEVE.

4 ALL DIODES ARE IN9168 (PN211083)

3 TRANSISTORS ARE

200200 = Q3,5,9,10,12,13,14,15

200369 = Q1, Q6, Q7

200358 = Q2, Q4

200244 = Q8, Q11

2 REF SCHEMATIC 431611

1. ASSY PROCESSES & PROCEDURES TO CONFORM TO DANA WORKMANSHIP STANDARDS

NOTES UNLESS OTHERWISE SPECIFIED

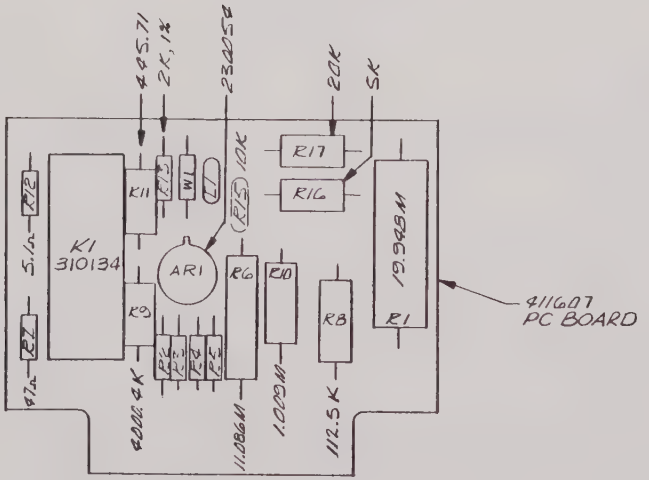
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PCB ASSY
OHMS

SIZE	CODE IDENT NO	DWG NO	REV
D	21793	401612	R

SCALE 1:1 SHEET 1 OF 6



3 RESISTOR VALUES ARE IN OHMS, ±5%, 1/4W

2 REF. SCHEMATIC 431.021

4 PROCEDURES

5 PROCEDURES TO DANA

NOTES UNLESS OTHERWISE SPECIFIED

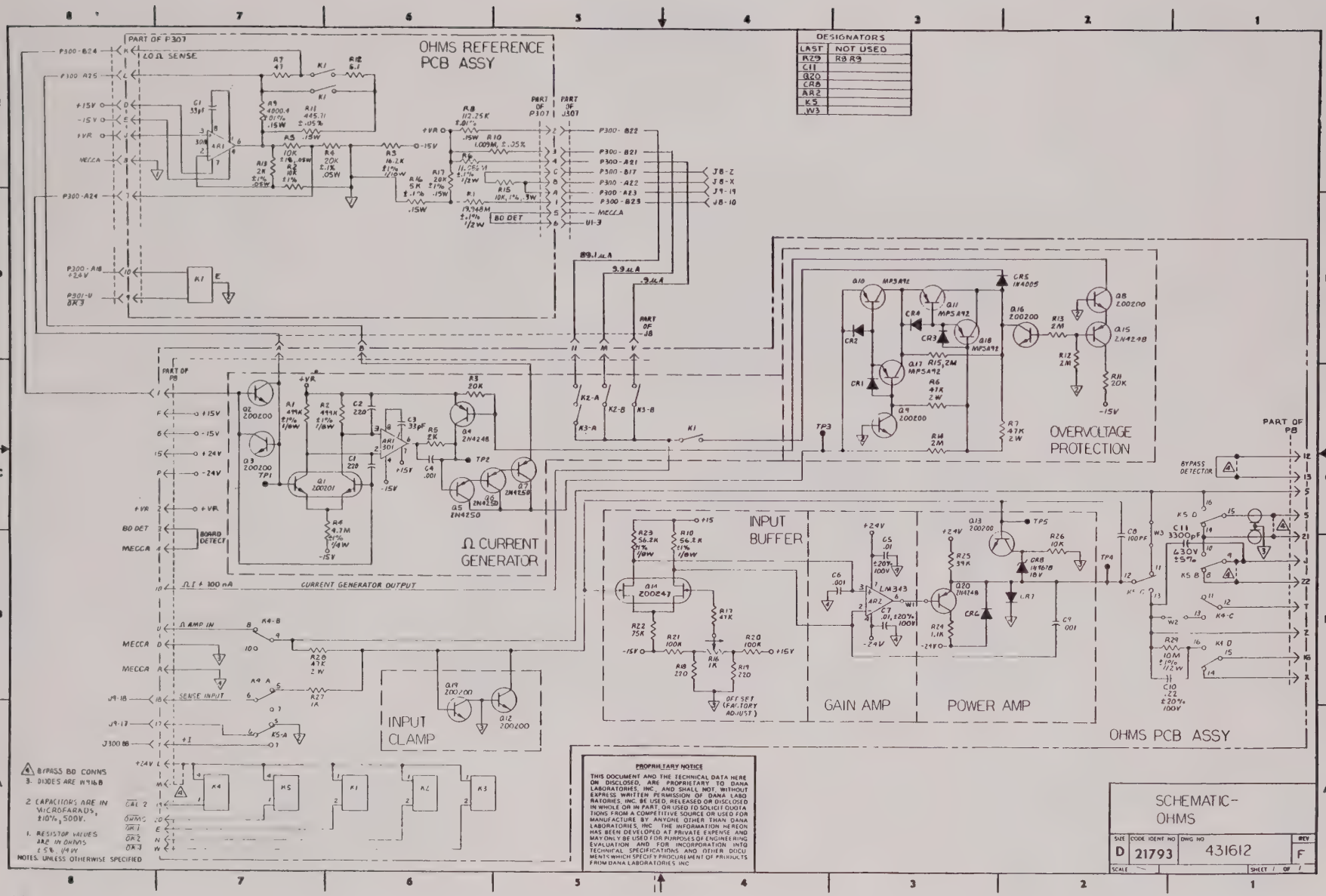
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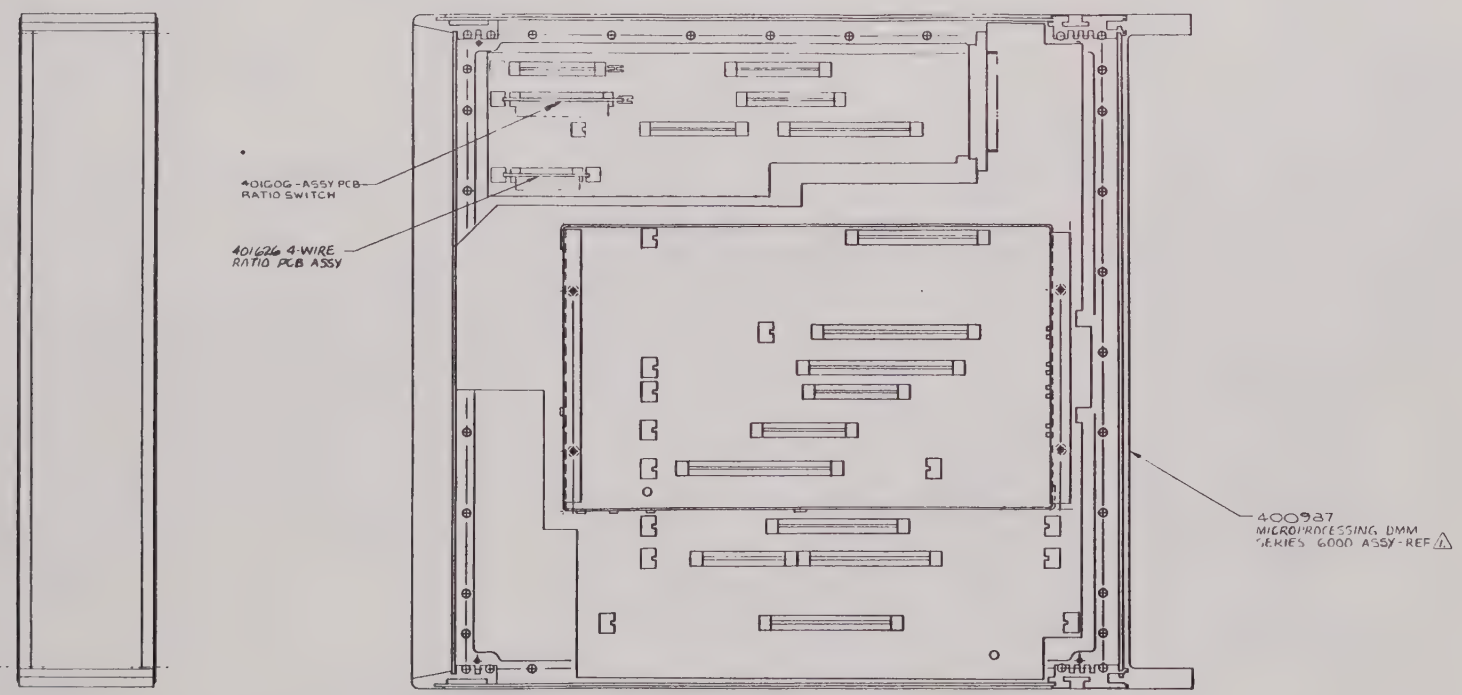
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P.C. BOARD ASSY
OHMS REFERENCE

SIZE	CODE IDENT NO	DWG NO	REV
C	21793	401607	D

SCALE 2X1 SHEET 1 OF 3


OHMS REFERENCE PCB ASSY
PART OF P307
P300-B24
P300-A25
+15V
-15V
+VR
MECCA
P300-A24
P300-A18 +24V
P301-U BK3
K1
LO Ω SENSE
A7 4Ω
A12 6Ω
A9 1000.4 Ω 0.01% .15W
A11 445.71 Ω ±.05% .15W
A5 10K ±1% .05W
A4 20K ±.1% .05W
A3 16.2K ±1% 1/10W
A6 5K ±.1% .15W
A8 112.25K ±.01% .15W
A10 1.009M ±.05%
A13 2K ±1% .05W
A2 10K ±1% .05W
A14 11.062K ±1% 1/2W
A17 20K ±1% .15W
A15 10K, 1% .3W
A1 19.948M ±.1% 1/2W
80 DET
PART OF P307
PART OF J307
P300-B22
P300-B21
P300-B17
P300-A22
P300-A23
P300-B23
MECCA
U1-3
J8-Z
J8-X
J9-19
J8-10
89.1 μA
9.9 μA
-9 μA
PART OF J8
K2-A
K2-B
K3-B
K3-A
K1
TP3
Q10 MPSA92
Q11 MPSA92
Q18 MPSA92
Q17 MPSA92
Q9 2N2907
CR5 1N4005
CR4
CR3
CR2
CR1
Q16 2N2060
Q8 2N2060
Q15 2N4248
R13 2M
R12 2M
R11 20K
-15V
R6 47K 2W
R7 47K 2W
R14 2M
OVERVOLTAGE PROTECTION
PART OF P8
Q2 2N2060
Q3 2N2060 TP1
A1 499K ±1% 1/8W
A2 499K ±1% 1/8W
C2 220
C3 33pF
A3 20K
A4 2K
C1 220
A5 2K
C4 .001
Q4 2N4248
Q5 2N4250
Q6 2N4250
Q7 2N4258
TP2
A6 4.7M ±2% 1/4W
Q1 2N2081
BD DET
BOARD DETECT
Ω CURRENT GENERATOR
Ω I ÷ 100 mA
CURRENT GENERATOR OUTPUT
Ω AMP IN
SENSE INPUT
K4-B
K5-A
A9 A
R26 47K 2W
R27 1K
100
INPUT CLAMP
Q19 2N2060
Q12 2N2060
INPUT BUFFER
R23 56.2K ±1% 1/8W
R10 56.2K ±1% 1/8W
Q1A 2N2047
R17 47K
R22 75K
R21 100K
R20 100K
R16 1K
R18 220
R19 220
OFFSET (FACTORY ADJUST)
GAIN AMP
C6 .001
C5 .01 ±20% 100V
C7 .01, ±20% 100V
LM343
AR2
W1
-24V
POWER AMP
Q13 2N2060
TP5
R25 39K
R26 10K
Q20 2N4248
CR8 1N6078 18V
CR6
L.R.1
R24 1.1K
C8 100PF
C9 .001
TP4
W3
K5 D
K5 B
K4-C
K4 D
C11 3300pF 630V ±5%
R29 10M ±1% 1/2W
C10 .22 ±20% 100V
BYPASS DETECTOR
PART OF P8
OHMS PCB ASSY
K4
K5
K1
K2
K3
BYPASS BD CONNS
DIODES ARE IN4148
CAPACITORS ARE IN MICROFARADS, ±10%, 500V.
RESISTOR VALUES ARE IN OHMS ±5% 1/4W
NOTES: UNLESS OTHERWISE SPECIFIED
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DESIGNATORS
LAST NOT USED
R29 R8 R9
C11
Q20
CR8
AR2
K5
W3
SCHEMATIC- OHMS
SIZE D
CODE IDENT NO 21793
DWG NO 431612
REV F
SCALE
SHEET 1 OF 1



2. ASSEMBLE PER DANA WORKMANSHIP MANUAL

⚠ COVERS AND OT-E2 PCB ASSY'S NOT SHOWN FOR CLARITY.

NOTES: UNLESS OTHERWISE SPECIFIED

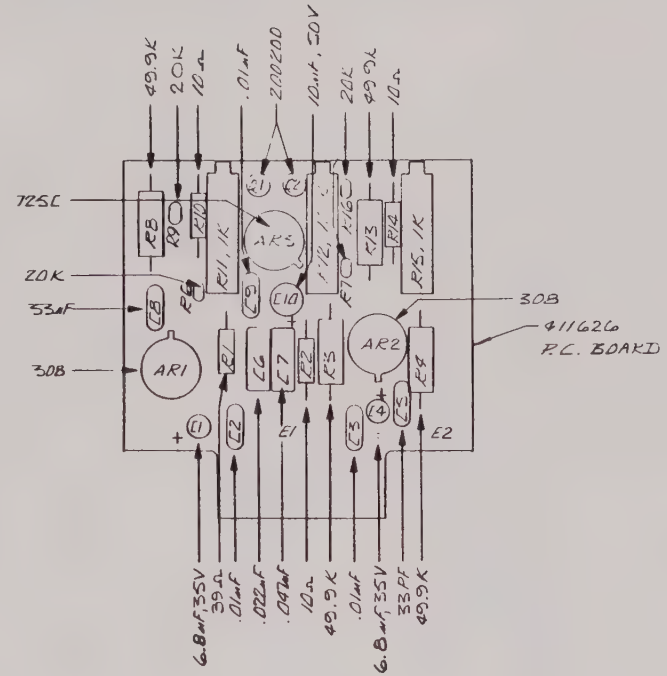
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4 WIRE RATIO
OPTION ASSY

SIZE	CODE IDENT NO	DWG NO	REV
D	21793	404025	D

SCALE 4:1 SHEET 1 OF 2



3. RESISTORS ARE IN OHMS, ±5%, 1/4W.
2. REF SCHEMATIC 93/1626
1. ASSY PROCESSES & PROCEDURES TO CONFORM TO DANA WORKMANSHIP STANDARDS

NOTES: UNLESS OTHERWISE SPECIFIED

PROPRIETARY NOTICE

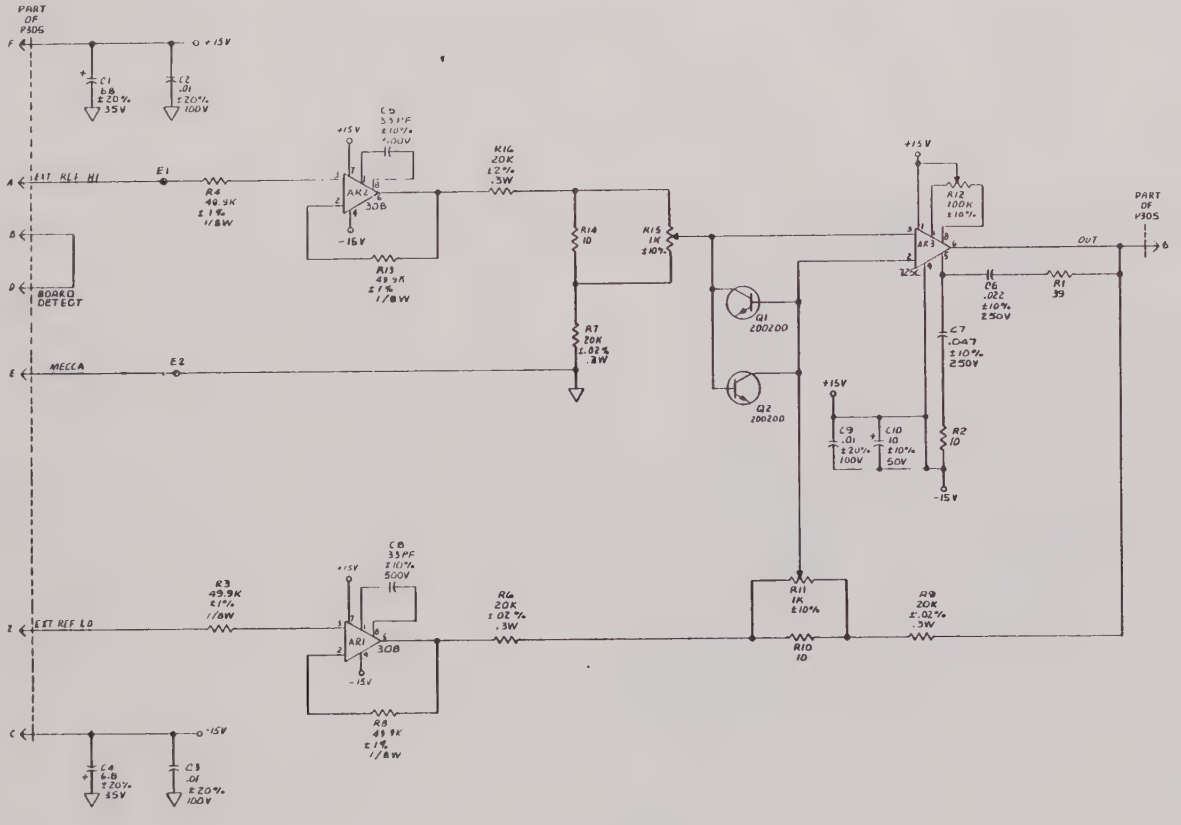
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PCB ASSY
& WIRE RATIO

SIZE	CODE IDENT NO	DWG NO	REV
C	21793	411626	B

SCALE 2 : 1 SHEET 1 OF 3

7-69



NOTES UNLESS OTHERWISE SPECIFIED

2 CAPACITOR VALUES ARE IN MICROFARADS
1 RESISTOR VALUES ARE IN OHMS, ±1%, 1/8W

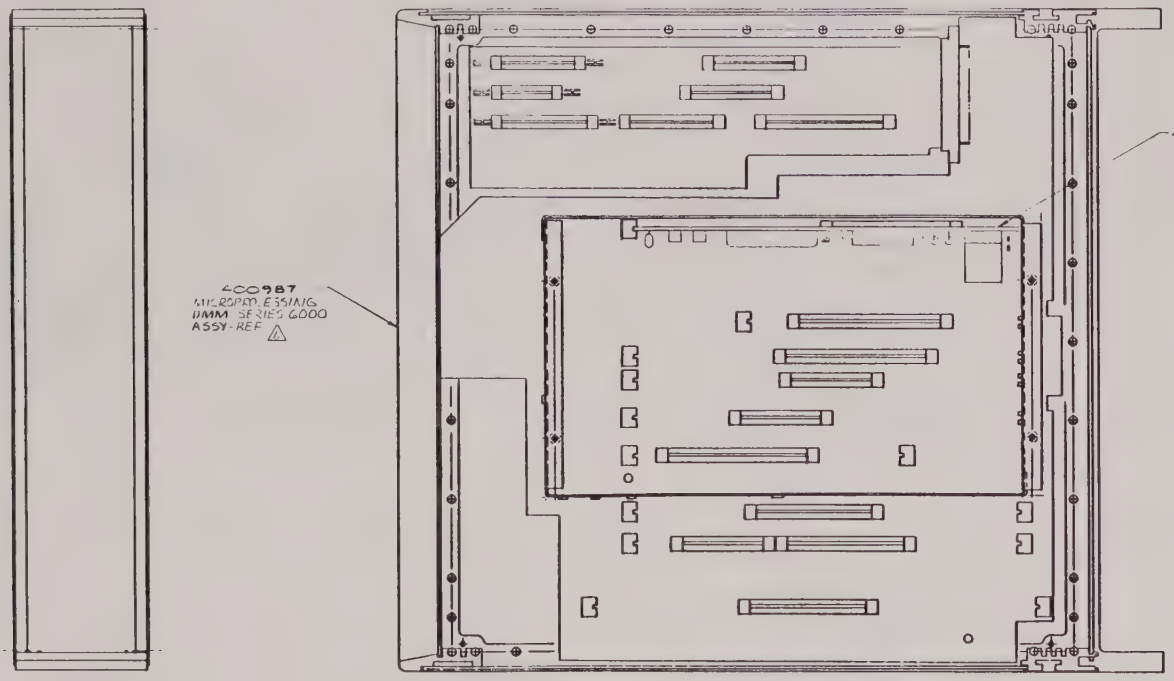
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SCHEMATIC - 4 WIRE RATIO

SIZE	CODE IDENT NO	DWG NO	REV
D	21793	431626	A

SCALE | SHEET 1 OF 1



4 DISASSEMBLE PER DANA WORKMANSHIP MANUAL.
1 COVERS AND OTHER PCB ASSYS NOT SHOWN FOR CLARITY.

NOTES: UNLESS OTHERWISE SPECIFIED

PROPRIETARY NOTICE

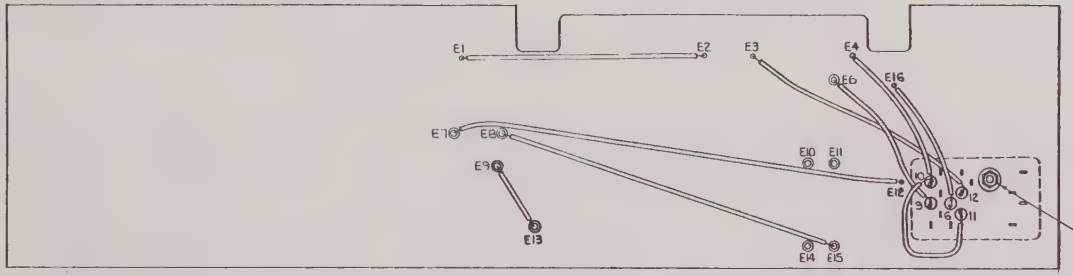
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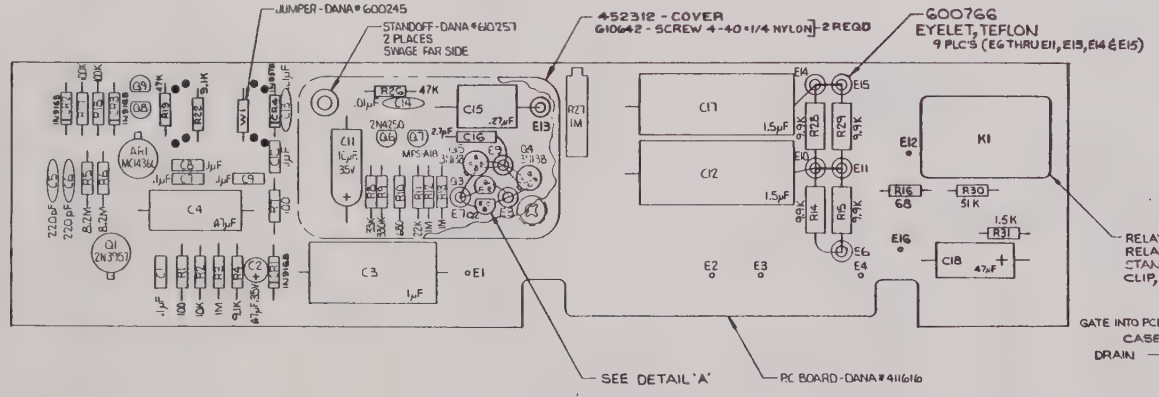
PREAMPLIFIER OPTION ASSY

SIZE	CODE IDENT NO	DWG NO	REV
D	21793	4C4024	B

SCALE: 2:1 SHEET 1 OF 2

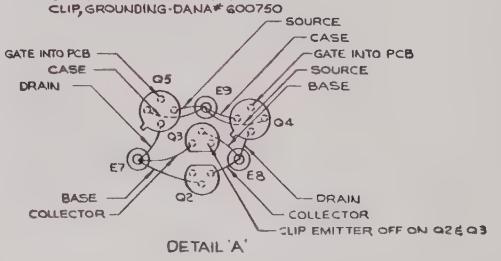
7-71




JUMPER - DANA # 600245
STANDOFF - DANA # 610257
2 PLACES
SWAGE FAR SIDE
452312 - COVER
G10642 - SCREW 4-40 x 1/4 NYLON - 2 REQD
600766
EYELET, TEFLON
9 PLC'S (E6 THRU E11, E13, E14 & E15)
RELAY - DANA # 310112
RELAY SOCKET - DANA # 600748
STANDOFF - DANA # G10744
CLIP, GROUNDING - DANA # 600750
SEE DETAIL 'A'
PC BOARD - DANA # 4116616



WIRE PREPARATION



DETAIL 'A'

5 TRANSISTORS ARE DANA # 200200.
4 DIODES ARE IN9168 (211083).
3 RESISTORS ARE IN OHMS, ±5%, 1/4 W.
2 REFERENCE SCHEMATIC NUMBER 4316616.
1 ASSEMBLY PROCEEDURES AND PROCESSES TO CONFORM TO DANA WORKMANSHIP MANUAL.

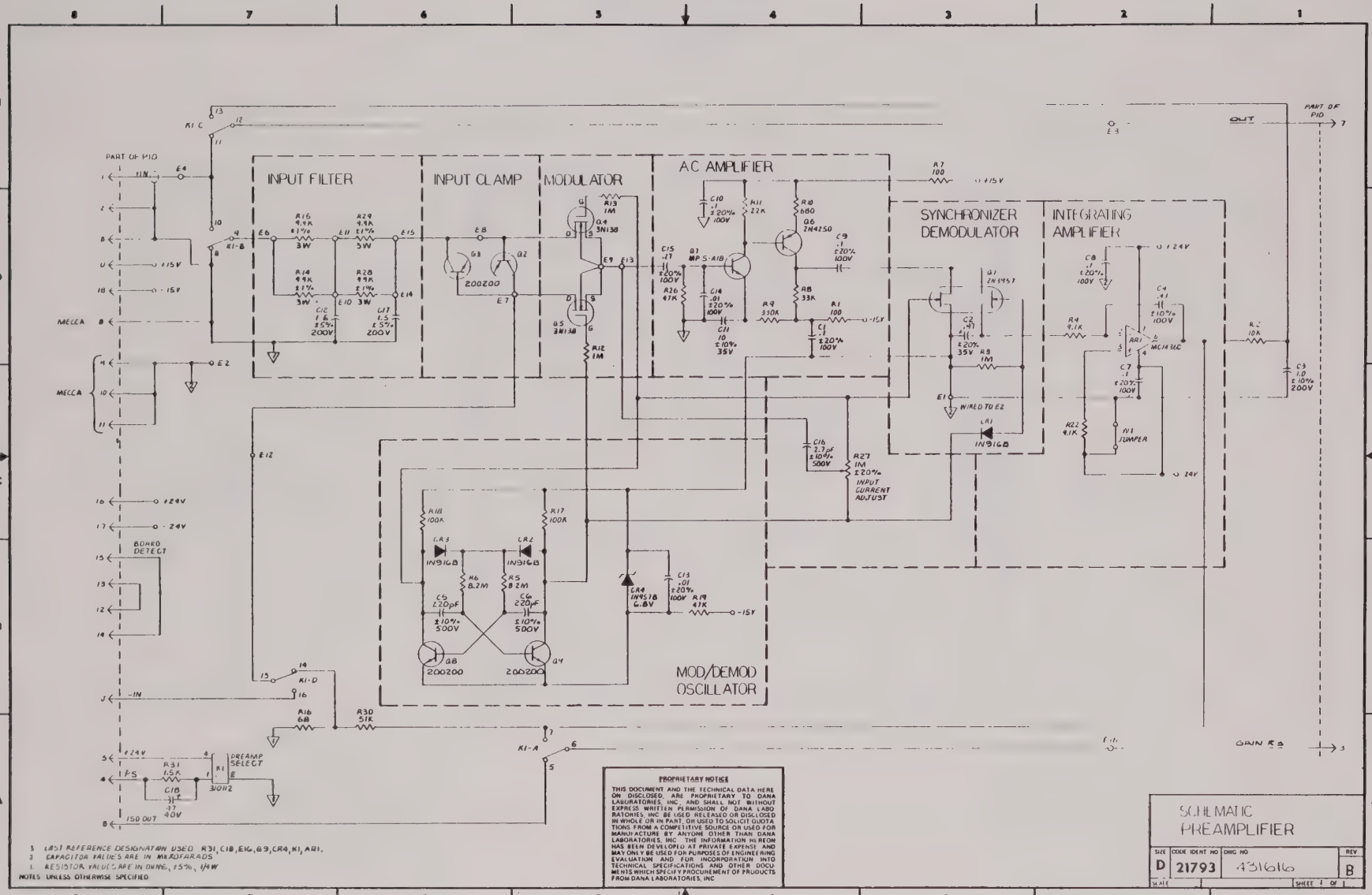
NOTES: UNLESS OTHERWISE SPECIFIED

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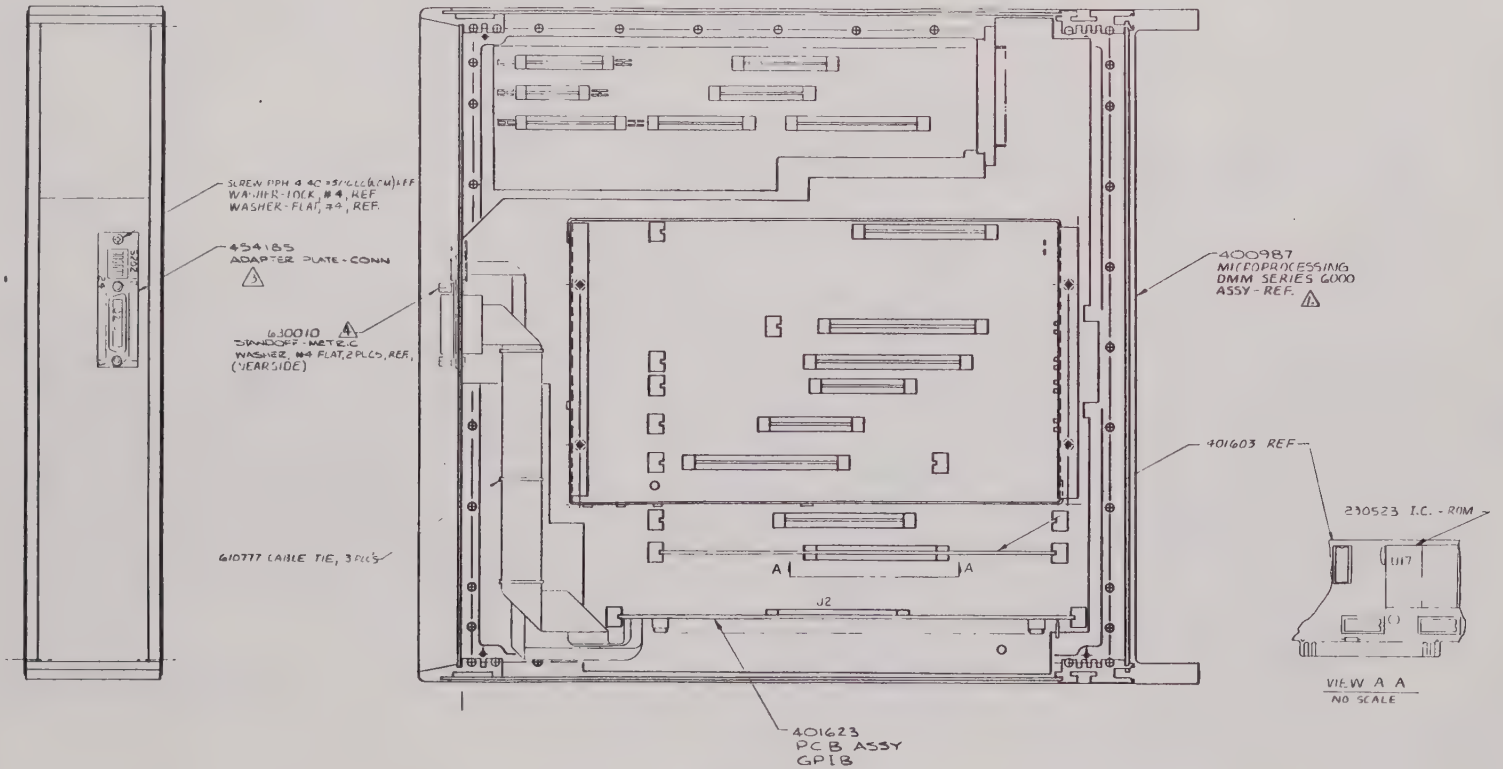
P.C. BOARD ASSEMBLY — PREAMPLIFIER

SIZE	CODE IDENT NO	DWG NO.	REV
D	21793	401616	D

SCALE 1/1 SHEET 1 OF 5


INPUT FILTER
INPUT CLAMP
MODULATOR
A.C AMPLIFIER
SYNCHRONIZER DEMODULATOR
INTEGRATING AMPLIFIER
MOD/DEMOD OSCILLATOR
PART OF PIO
OUT
-IN
+24V
-24V
-15V
+15V
BOARD DETECT
PREAMP SELECT
INPUT CURRENT ADJUST
WIRED TO E2
JUMPER
GAIN
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SCHEMATIC
PREAMPLIFIER
SIZE D
CODE IDENT NO 21793
DWG NO 431616
REV B
SCALE
SHEET 1 OF 1
NOTES UNLESS OTHERWISE SPECIFIED
1. RESISTOR VALUES ARE IN OHMS, ±5%, 1/4W
2. CAPACITOR VALUES ARE IN MICROFARADS
3. LAST REFERENCE DESIGNATION USED R31, C18, E16, G9, CR4, K1, AR1.

7-73



5 FIELD INSTALLATION INSTRUCTION SHEET 980610

4 DISCARD NUTS AND LOCKWASHERS.

3 REMOVE BUTCH PLATE -54183 BEFORE MTG CONN AND INSTALL BOARD ASSEMBLE PER RACAL-DANA WORKMANSHIP MANUAL

2 COVERS & OTHER PC B ASSY'S NOT SHOWN FOR CLARITY

NOTES: UNLESS OTHERWISE SPECIFIED

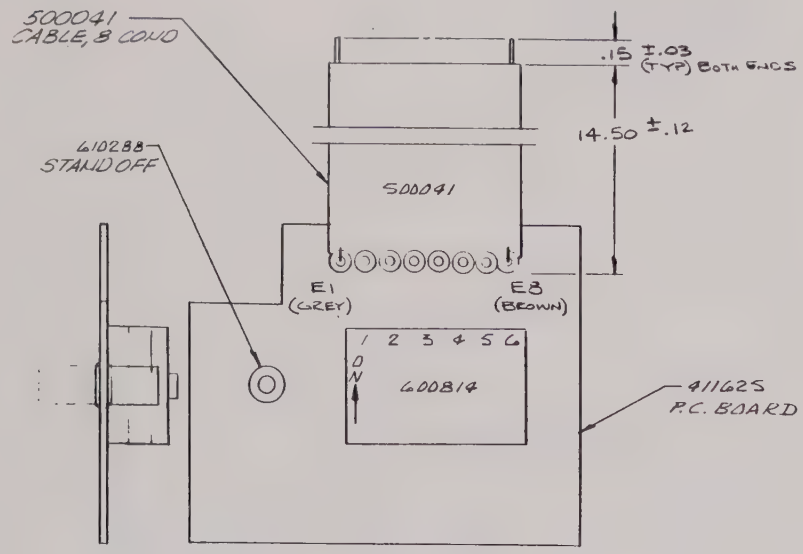
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GPIB IEEE-488-1975
OPTION ASSY

SIZE	CODE IDENT NO	DWG NO	REV
D	21793	404017	H

SCALE - SHEET 1 OF 1



1. ASSY PROCESSES & PROCEDURES TO CONFORM TO DANA WORKMANSHIP STANDARDS

NOTES: UNLESS OTHERWISE SPECIFIED

PROPRIETARY NOTICE

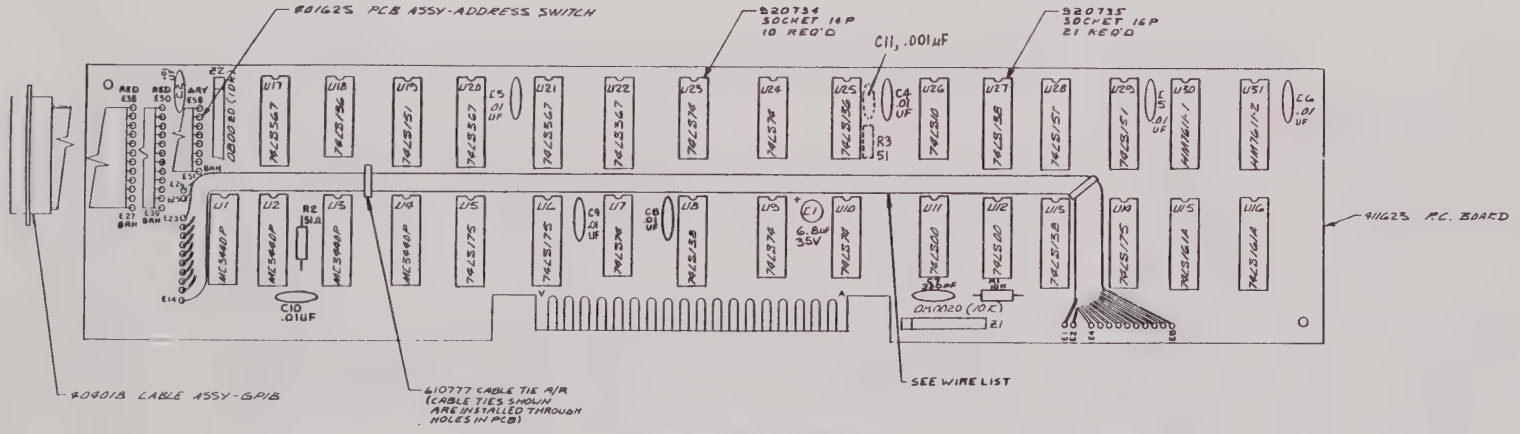
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ASSY
GPIB ADDRESS SWITCH

SIZE	CODE IDENT NO	DWG NO	REV
C	21793	411625	C

SCALE 1×1 SHEET 1 OF 2

7-75



COMPONENT SIDE SHOWN

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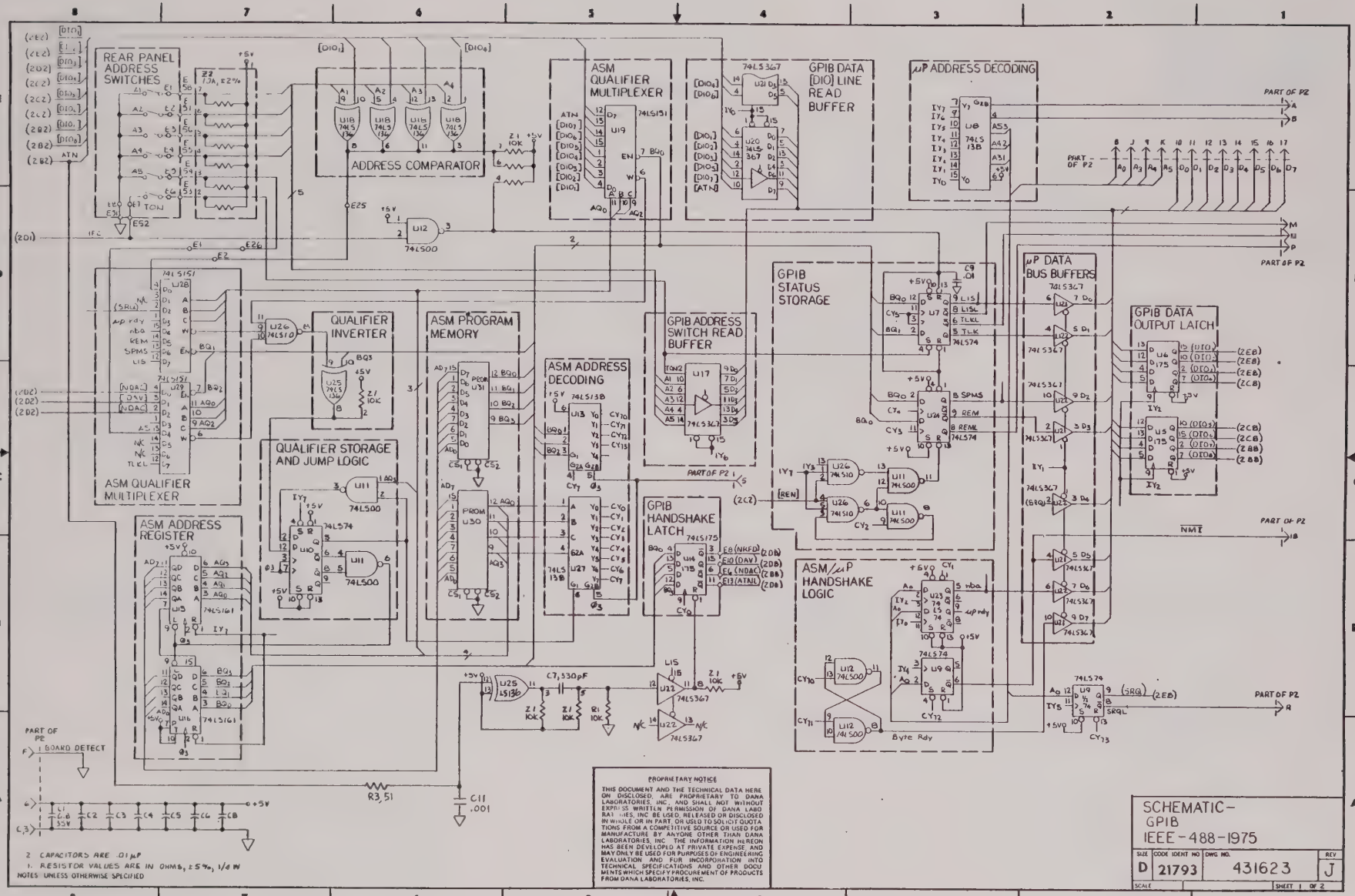
2. REF SCHEMATIC #81623.
1. ASSY PROCESSES & PROCEDURES TO CONFORM TO DANA WORKMANSHIP STANDARDS.

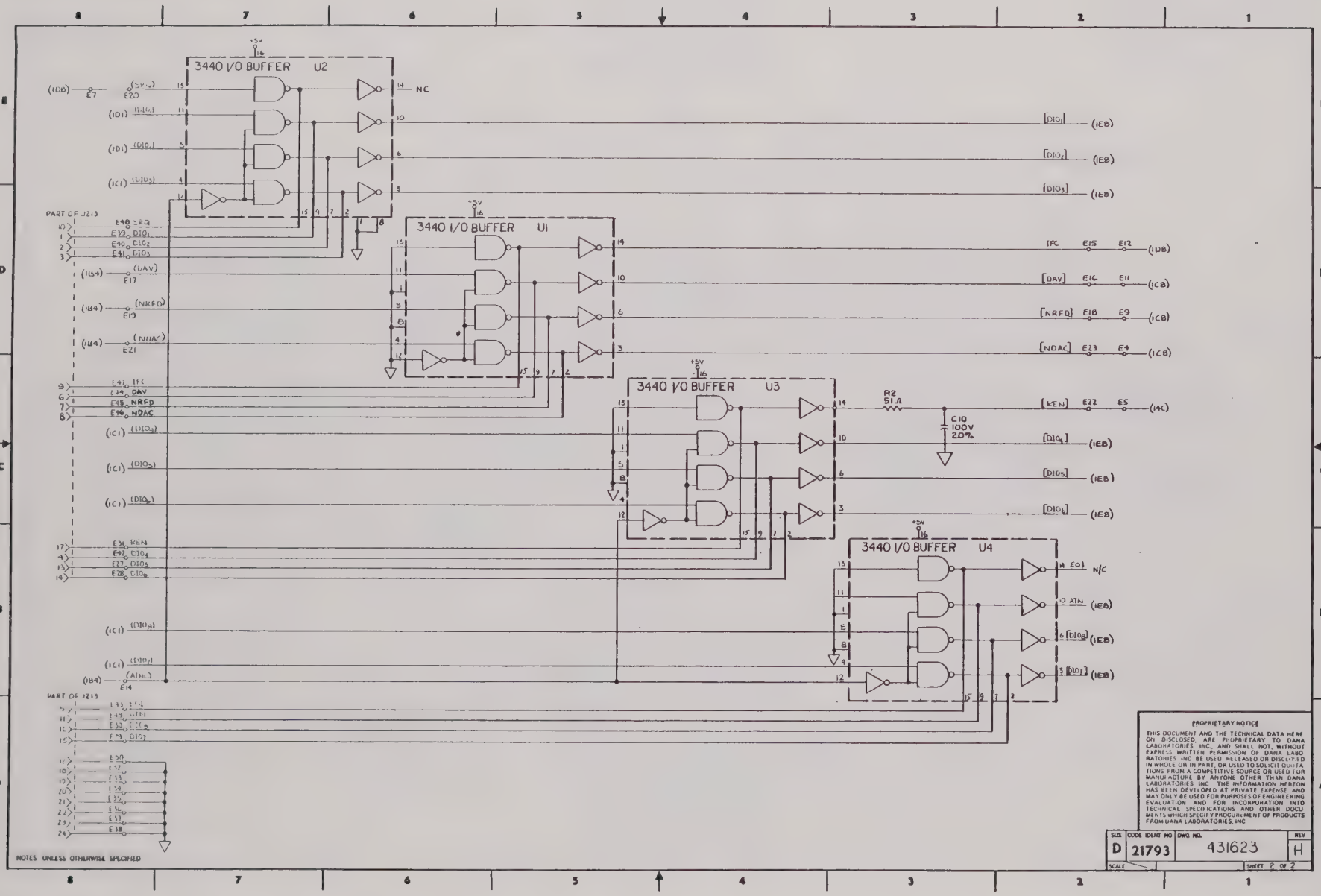
NOTES: UNLESS OTHERWISE SPECIFIED

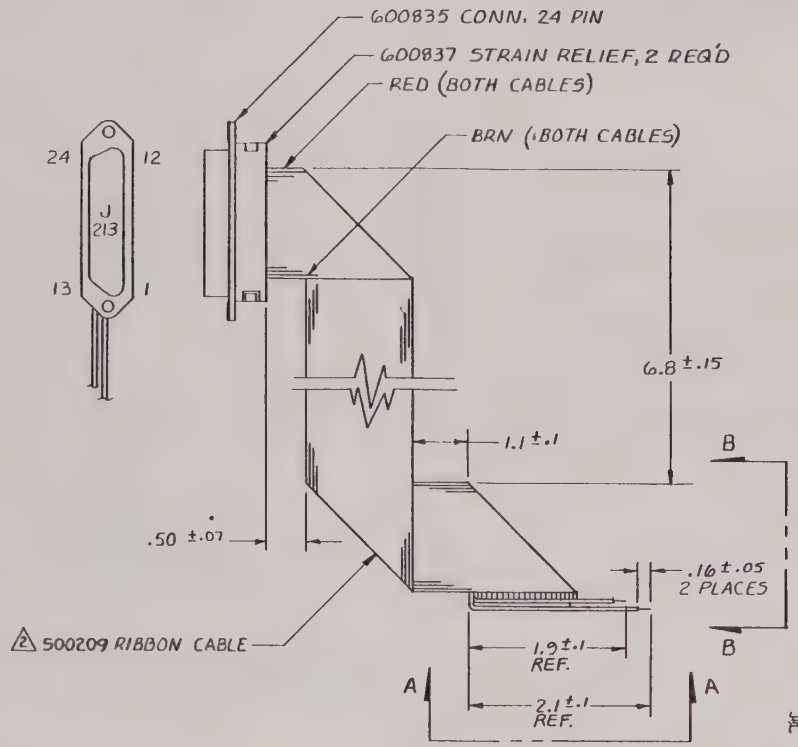
P.C. BOARD ASSY
GPIB - IEEE - 488 - 1975

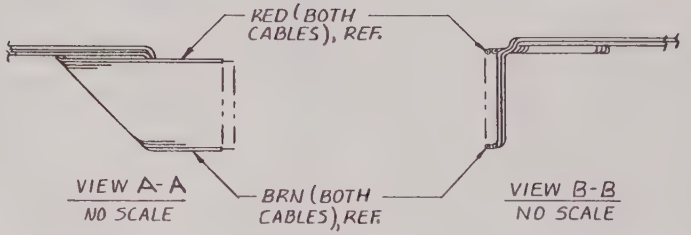
SIZE	CODE IDENT NO	DWG NO.	REV
D	21793	911623	K

SCALE: SHEET 1 OF 1


REAR PANEL ADDRESS SWITCHES
ADDRESS COMPARATOR
ASM QUALIFIER MULTIPLEXER
GPIB DATA [DIO] LINE READ BUFFER
μP ADDRESS DECODING
QUALIFIER INVERTER
ASM PROGRAM MEMORY
ASM ADDRESS DECODING
GPIB ADDRESS SWITCH READ BUFFER
GPIB STATUS STORAGE
μP DATA BUS BUFFERS
GPIB DATA OUTPUT LATCH
QUALIFIER STORAGE AND JUMP LOGIC
ASM ADDRESS REGISTER
GPIB HANDSHAKE LATCH
ASM/μP HANDSHAKE LOGIC
PROPRIETARY NOTICE
SCHEMATIC- GPIB IEEE-488-1975
SIZE D
CODE IDENT NO 21793
DWG NO. 431623
REV J
SHEET 1 OF 2


3440 I/O BUFFER U2
3440 I/O BUFFER U1
3440 I/O BUFFER U3
3440 I/O BUFFER U4
+5V
PART OF J213
NC
N/C
R2
51Ω
C10
100V
20%
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SIZE D
CODE IDENT NO 21793
DWG NO. 431623
REV H
SCALE
SHEET 2 OF 2
NOTES UNLESS OTHERWISE SPECIFIED





VIEW A-A
NO SCALE

VIEW B-B
NO SCALE

2 CABLE LENGTH PRIOR TO FOLDING WILL BE 13.20 ± .01.

1. ASSY PROCESSES AND PROCEDURES TO CONFORM TO DANA WORKMANSHIP STANDARDS.

NOTES: UNLESS OTHERWISE SPECIFIED

PROPRIETARY NOTICE

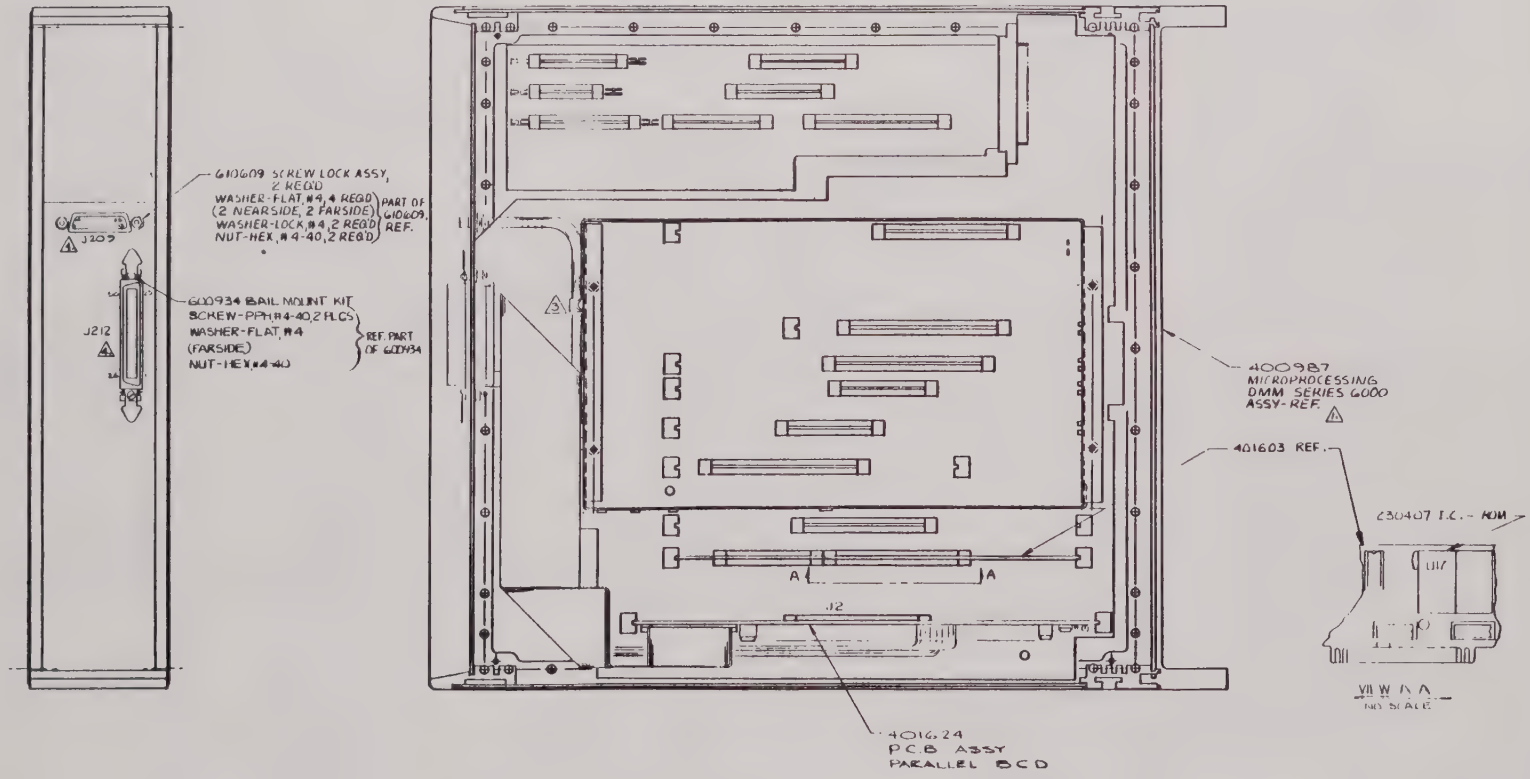
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CABLE ASSY-GPIB

SIZE	CODE IDENT NO	DWG NO.	REV
C	21793	404018	D

SCALE NONE | SHEET 1 OF 2

7-79



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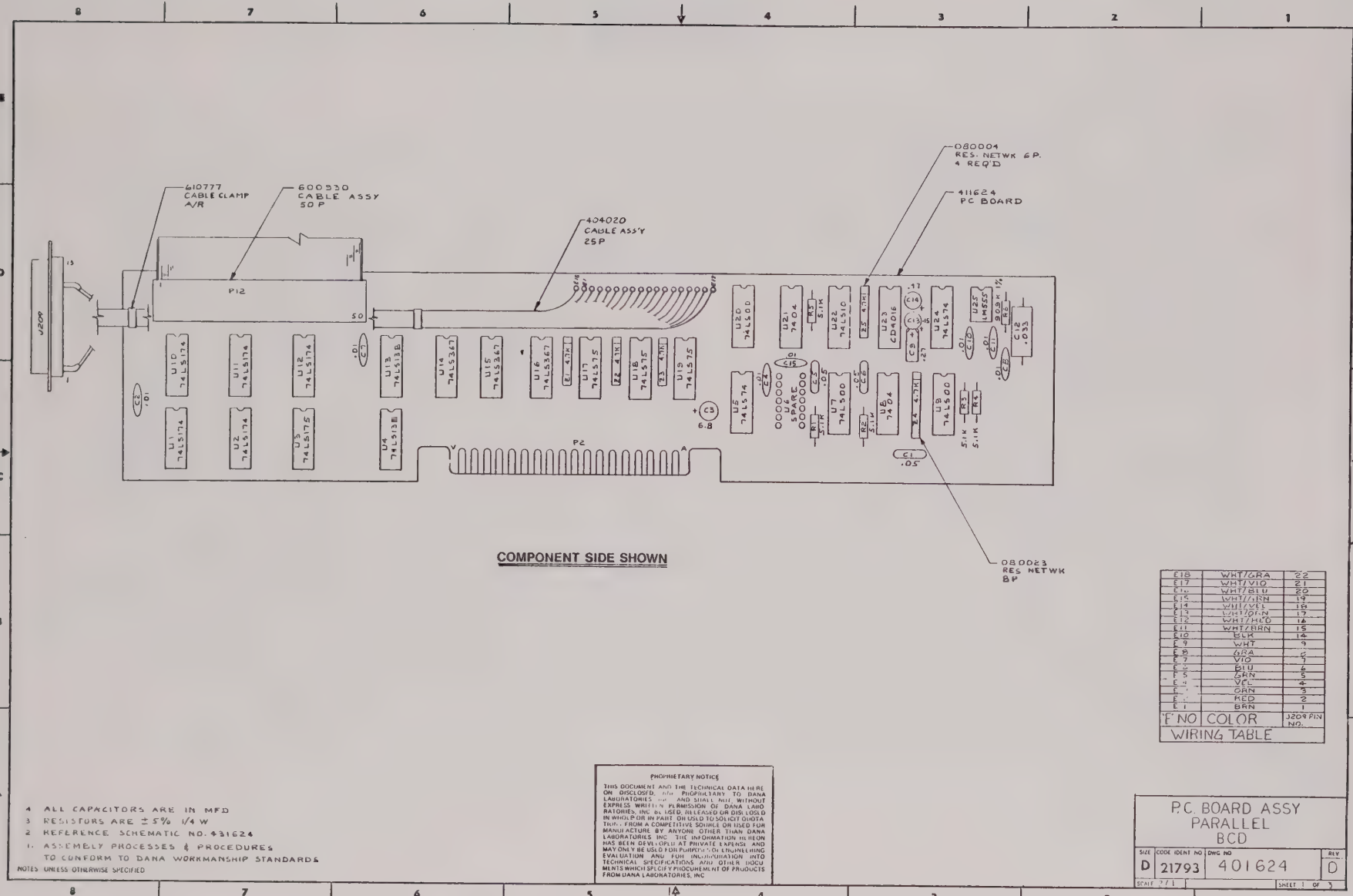
1. REMOVE BUTCH PLATES 454183 & 454184 BEHIND MTG CONNECTORS
2. ROUTE CABLE THRU EXISTING CLAMPS (610491) ON 454177 SHIELD
2. ASSEMBLE PER PACAL-DANA WORKMANSHIP MANUAL
1. COVERS AND OTHER PCB ASSY'S NOT SHOWN FOR CLARITY.

NOTES: UNLESS OTHERWISE SPECIFIED

PARALLEL BCD OPTION ASSY

SIZE	CODE IDENT NO	DWG NO	REV
D	21793	404019	D

SCALE: NONE SHEET 1 OF 2



E18	WHT/GRA	22
E17	WHT/VIO	21
E16	WHT/BLU	20
E15	WHT/GRN	19
E14	WHT/YEL	18
E13	WHT/ORN	17
E12	WHT/RED	16
E11	WHT/BRN	15
E10	BLK	14
E9	WHT	9
E8	GRA	8
E7	VIO	7
E6	BLU	6
E5	GRN	5
E4	YEL	4
E3	ORN	3
E2	RED	2
E1	BRN	1
E NO	COLOR	J209 PIN NO.

WIRING TABLE

4 ALL CAPACITORS ARE IN MFD
3 RESISTORS ARE ±5% 1/4 W
2 REFERENCE SCHEMATIC NO. 431624
1. ASSEMBLY PROCESSES & PROCEDURES TO CONFORM TO DANA WORKMANSHIP STANDARDS

NOTES UNLESS OTHERWISE SPECIFIED

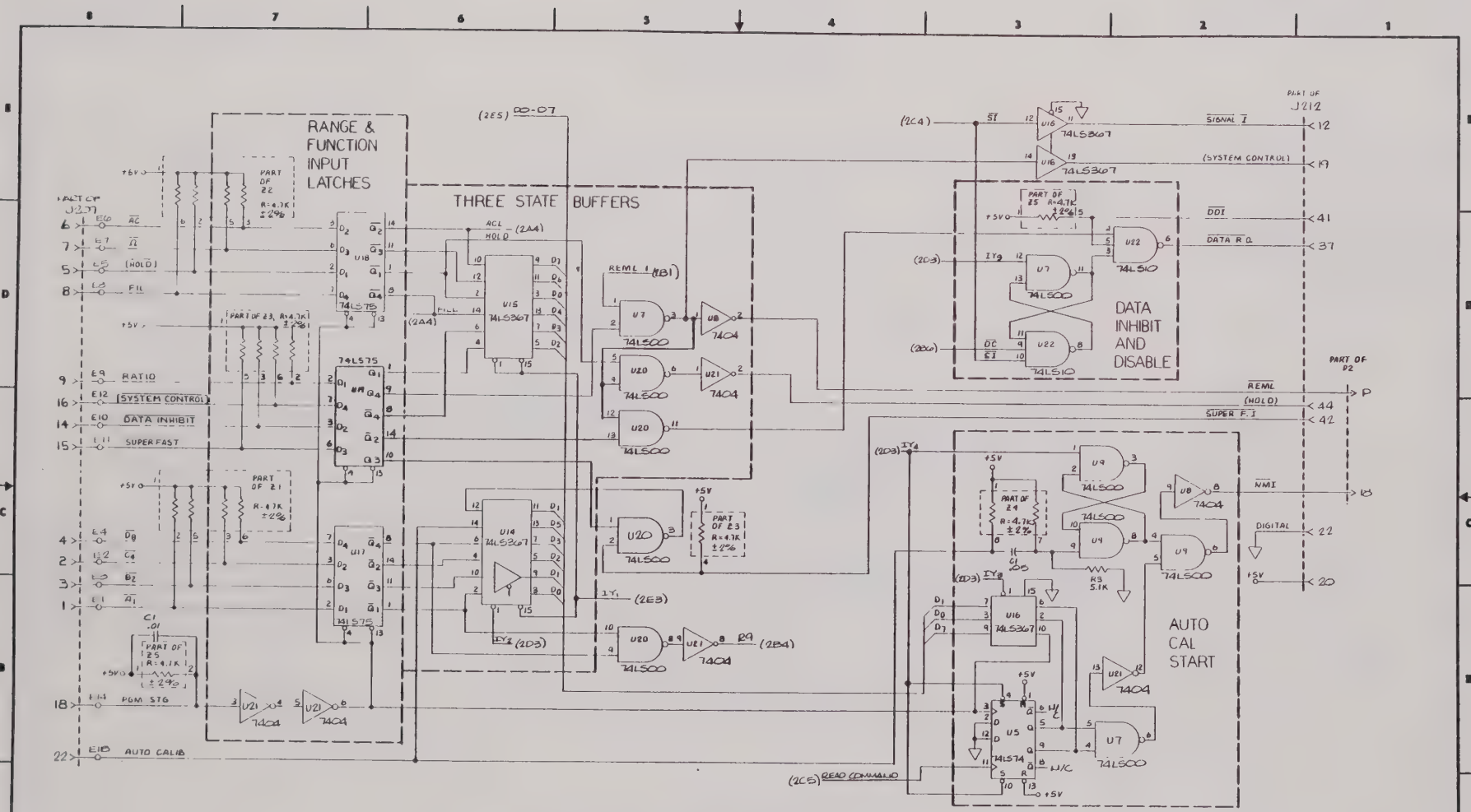
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P.C. BOARD ASSY
PARALLEL
BCD

SIZE	CODE IDENT NO	DWG NO	REV.
D	21793	401624	D

SCALE 2/1 SHEET 1 OF 3

7-81



2. ALL CAPACITORS ARE IN MICROFARADS, ±20%, 100 VOLTS.
1. ALL RESISTORS ARE IN OHMS, ¼ WATT, ±5%.

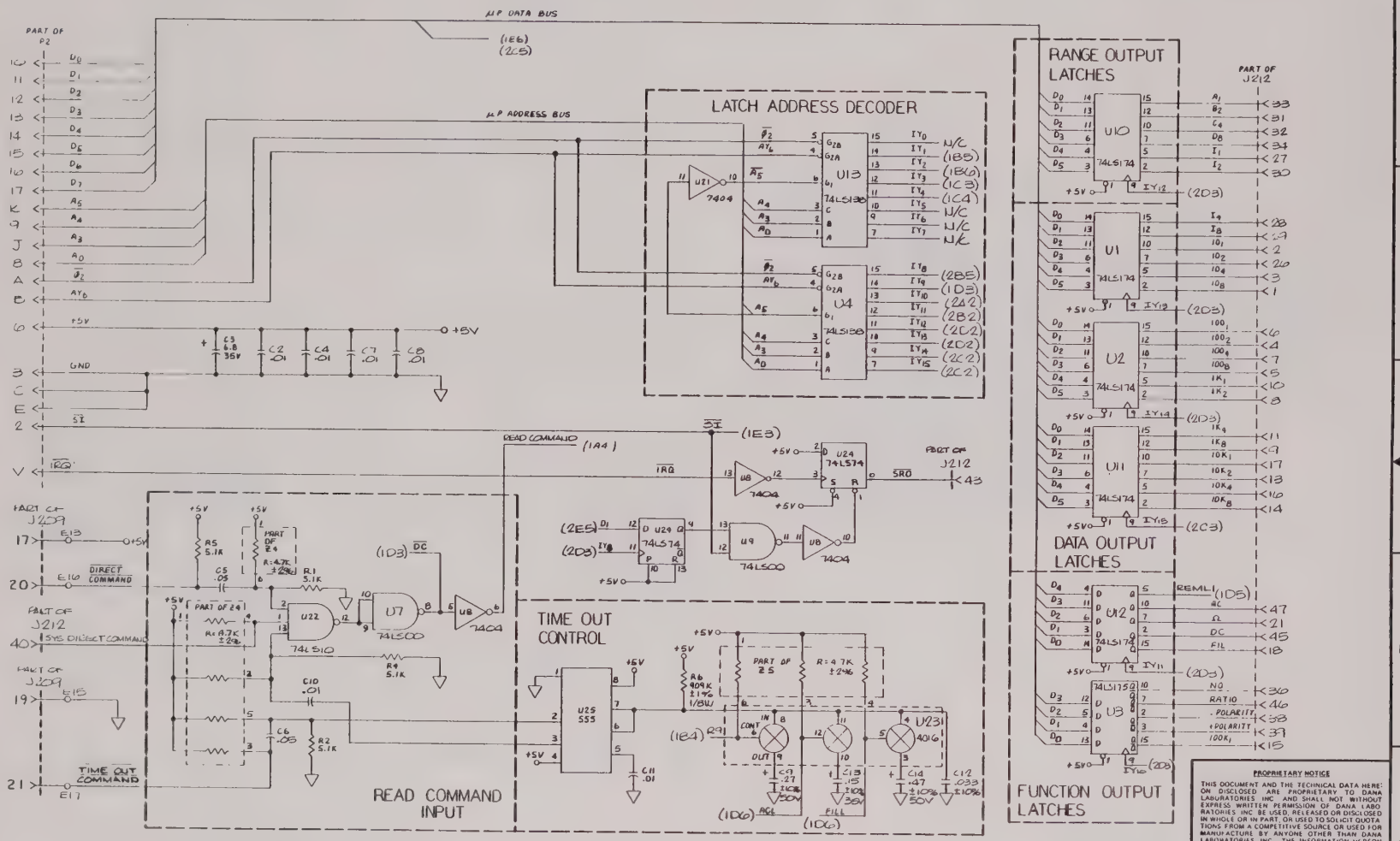
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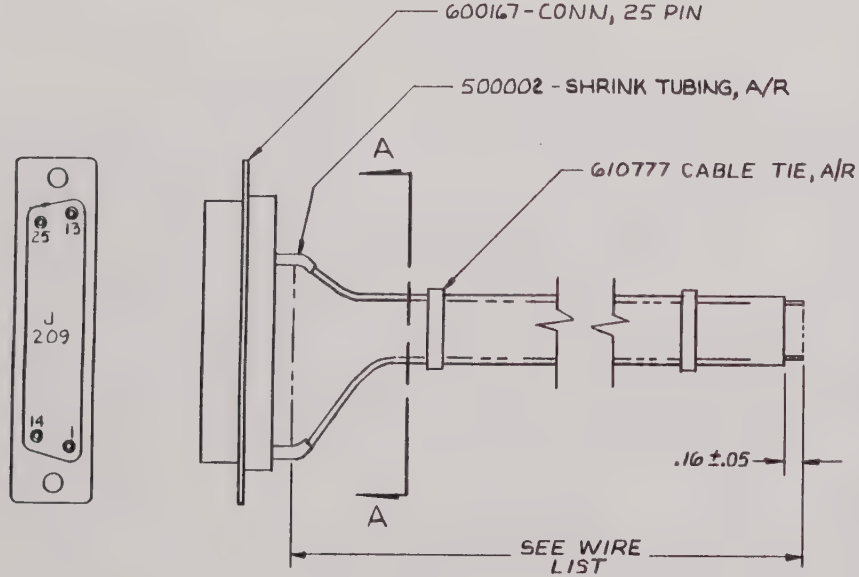
SCHEMATIC - PARALLEL BCD

SIZE	CODE IDENT NO	DWG NO	REV
D	21793	431624	D

SCALE: SHEET 1 OF 2

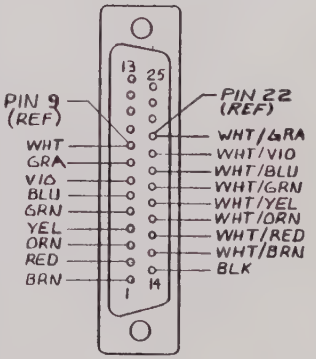

µP DATA BUS
µP ADDRESS BUS
LATCH ADDRESS DECODER
RANGE OUTPUT LATCHES
DATA OUTPUT LATCHES
FUNCTION OUTPUT LATCHES
TIME OUT CONTROL
READ COMMAND INPUT
DIRECT COMMAND
SYS DIRECT COMMAND
TIME OUT COMMAND
READ COMMAND (1A4)
PART OF P2
PART OF J212
PART OF J209
+5V
GND
74LS174
74LS138
74LS74
74LS00
74LS10
74LS175
74LS14
7404
4016
555
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SIZE D
CODE IDENT NO 21793
DWG NO. 431624
REV D
SCALE —
SHEET 2 OF 2
NOTES: UNLESS OTHERWISE SPECIFIED

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J209 PIN #	COLOR	PART NO.	LENGTH ± .15
22	WHT/GRA	524989	20.0
21	WHT/VIO	524979	21.2
20	WHT/BLU	524969	20.0
19	WHT/GRN	524959	20.0
18	WHT/YEL	524949	20.0
17	WHT/ORN	524939	20.0
16	WHT/RED	524929	22.1
15	WHT/BRN	524919	20.0
14	BLK	524000	20.0
9	WHT	524999	20.0
8	GRA	524888	20.0
7	VIO	524777	21.5
6	BLU	524666	21.2
5	GRN	524555	21.2
4	YEL	524444	20.0
3	ORN	524333	20.0
2	RED	524222	20.0
1	BRN	524111	20.0

WIRE LIST



VIEW A-A
SCALE 2/1

2. TAG & IDENTIFY WITH DANA P/N & CURRENT REV. LTR.
1. ASSY PROCESSES & PROCEDURES TO CONFORM TO DANA WORK. STDS.
NOTES: UNLESS OTHERWISE SPECIFIED

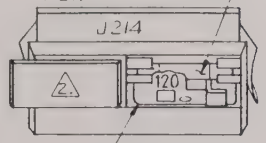
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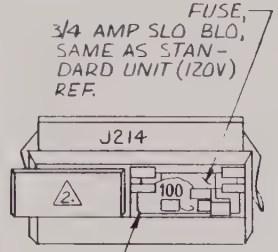
CABLE ASSEMBLY- PARALLEL BCD, 25 PIN

SIZE	CODE IDENT NO	DWG NO	REV
C	21793	404020	C

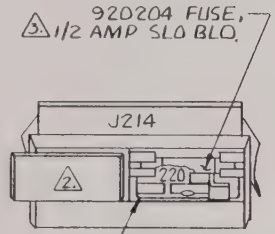
SCALE 2:1 SHEET 1 OF 3



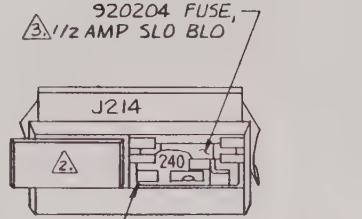
120V (STANDARD UNIT) REF.



100V OPTION ASSY



220V OPTION ASSY



240V OPTION ASSY

3. REMOVE & RETURN STANDARD FUSE TO STOCK.

2. FUSE & PCB ACCESS COVER SHOWN IN OPEN POSITION

1. ASSEMBLE PER DANA WORKMANSHIP MANUAL

NOTES. UNLESS OTHERWISE SPECIFIED

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100V, 220V, 240V OPTION ASSY

SIZE	CODE IDENT NO	DWG NO	REV
C	21793	404042	A

SCALE — SHEET / OF

7-85

SECTION 8 PARTS LIST

8.1 This section contains lists of replaceable parts arranged in the order of the following subassemblies:

Front Panel 8-4
Rear Panel 8-5
Motherboard 8-6
Non-Volatile Memory Cable 8-9
Display 8-10
Calibration Module 8-12
Attenuator Reference 8-13
10V Reference 8-16
Interconnection 8-17
Non-Volatile Memory 8-18
Digitizer 8-20
Isolator 8-25
Switching 8-27
Computer I 8-28
Control Logic 8-29
Parallel BCD 8-30
Parallel BCD Cable 8-33
Ohms 8-34
Ohms Reference 8-36
AC Averaging Converter 8-37
4-Wire Ratio 8-40
RMS Converter 8-41
GPIB 8-44
GPIB Cable 8-46
Pre-Amplifier 8-47
Fast Digitizer 8-49
Fast Digitizer Cable 8-51
Ratio Switching 8-52
Scaling Amplifier 8-53
Sample and Hold Digitizer 8-56
50 Hz Modification 8-60

8.2 Manufacturers are identified by FSC numbers listed in table 8.1, "List of Suppliers". The code numbers are from the Federal Supply Code for Manufacturers Cataloging Handbooks H4-1, H4-2, and their supplements.

Table 8.1 - List of Suppliers

FSC	NAME
00779	AMP, INC. HARRISBURG, PENNSYLVANIA
01121	ALLEN BRADLEY CO. MILWAUKEE, WISCONSIN
01295	TEXAS INSTRUMENTS, INC. DALLAS, TEXAS
02111	SPECTROL ELECTRONICS CORP. CITY OF INDUSTRY, CALIFORNIA
02114	FERROXCUBE CORP. SAUGERTIES, NEW YORK
02660	AMPHENOL CORP. BROADVIEW, ILLINOIS
04222	AEROVOX CORP. (Hi-Q Division) MYRTLE BEACH, SOUTH CAROLINA
04713	MOTOROLA, INC. (Semi Conductor Products Division) PHOENIX, ARIZONA
05397	UNION CARBIDE CORP. (Materials Systems Division) CLEVELAND, OHIO
05574	VIKING INDUSTRIES, INC. CHATSWORTH, CALIFORNIA
06665	PRECISION MONOLITHICS SANTA CLARA, CALIFORNIA
08257	NPC ELECTRONICS CANOGA PARK, CALIFORNIA
09023	CORNELL DUBILIER ELECTRONICS SANFORD, NORTH CAROLINA
11236	CTS OF BERNE, INC. BERNE, INDIANA
11237	CTS KEENE, INC. PASO ROBLES, CALIFORNIA
12406	ELPAC, INC. IRVINE, CALIFORNIA
12969	UNITRODE CORP. WATTERTOWN, MASSACHUSETTS
13919	BURR BROWN TUCSON, ARIZONA
14674	CORNING GLASS WORKS CORNING, NEW YORK
14936	GENERAL INSTRUMENTS CORP. (Semiconductor Products Group) HICKSVILLE, L.I., NEW YORK
15636	ELECTROL, INC. SAUGUS, CALIFORNIA
17856	SILICONIX, INC. SANTA CLARA, CALIFORNIA
18324	SIGNETICS CORP. SUNNYVALE, CALIFORNIA
18612	VISHAY RESISTOR PRODUCTS MALVERN, PENNSYLVANIA
19396	ILLINOIS TOOL WORKS, INC. (Paktron Division) ALEXANDRIA, VIRGINIA
21317	ELECTRONIC APPLICATIONS CO. SO. EL MONTE, CALIFORNIA
21551	CF ELECTRONICS, INC. VAN NUYS, CALIFORNIA
21793	RACAL-DANA INSTRUMENTS INC. IRVINE, CALIFORNIA
22045	JORDAN ELECTRIC CO. VAN NUYS, CALIFORNIA
23095	AZTEC ELECTRONICS, INC. ANAHEIM, CALIFORNIA
25088	SIEMENS CORP. (Comp. Group) ISELIN, NEW JERSEY
26806	AMERICAN ZETTLER, INC. COSTA MESA, CALIFORNIA
27014	NATIONAL SEMI CONDUCTOR CORP. SANTA CLARA, CALIFORNIA
27556	IMB ELECTRONIC PRODUCTS, INC. SANTA FE SPRINGS, CALIFORNIA
31471	AMERICAN MICRO SYSTEMS, INC. SANTA CLARA, CALIFORNIA
32767	GRIFFITH PLASTIC PRODUCTS CO. BURLINGAME, CALIFORNIA
34371	HARRIS SEMICONDUCTOR MELBOURNE, FLORIDA

Table 8.1 - List of Suppliers continued

FSC	NAME
50434	HEWLETT PACKARD CO. (HPA Division) PALO ALTO, CALIFORNIA
50579	LITRONIX, INC. CUPERTINO, CALIFORNIA
52763	STETTNER-TRUSH CAZENOVIA, NEW YORK
56289	SPRAGUE ELECTRIC CO. (Pacific Division) LOS ANGELES, CALIFORNIA
71471	AEROVOX CORP. (Cinema Plant) MONCKS CORNER, SOUTH CAROLINA
71590	CENTRALAB ELECTRONICS MILWAUKEE, WISCONSIN
71785	TRW ELECTRONIC COMPONENTS (Cinch Division) ELK GROVE VILLAGE, ILLINOIS
72136	ELECTRO MOTIVE MFG. CO., INC. WILLIMANTIC, CONNECTICUT
72982	ERIE TECHNOLOGICAL PRODUCTS, INC. ERIE, PENNSYLVANIA
73138	BECKMAN INSTRUMENTS, INC. FULLERTON, CALIFORNIA
73445	AMPEREX ELECTRONIC CORP. HICKSVILLE, L.I., NEW YORK
75915	LITTELFUSE, INC. DES PLAINES, ILLINOIS

FSC	NAME
74970	E. F. JOHNSTON CO. WASECA, MINNESOTA
79727	C-W INDUSTRIES WARMINSTER, PENNSYLVANIA
80131	ELECTRONICS INDUSTRIES ASSOC. WASHINGTON, D.C.
81312	WINCHESTER ELECTRONICS DIVISION (Litton Industries, Inc.) OAKVILLE, CONNECTICUT
81349	MILITARY SPECIFICATION
86884	RCA (Electronics Components Div.) HARRISON, NEW JERSEY
91293	JOHANSON MFG. CO. BOONTON, NEW JERSEY
91637	DALE ELECTRONICS, INC. COLUMBUS, NEBRASKA
95238	CONTINENTAL CONNECTOR WOODSIDE, NEW YORK
95275	VITRAMON, INC. BRIDGEPORT, CONNECTICUT
98291	SEALECTRO CORP. MAMARONECK, NEW YORK
99800	AMERICAN PRECISION INDUSTRIES, INC. (Delevan Div.) EAST AURORA, NEW YORK
——	LIBERTY ELECTRONICS EL SEGUNDO, CALIFORNIA

404011 – Assy., PANEL, FRONT

REF DES	RACAL-DANA P/N	DESCRIPTION	FSC	MANU P/N
S101	601109	SWITCH ROCKER DPST 12(4)A/250V	—	1545-0102
S102	454217	KEYBOARD ASSY	21793	454217

404013, 404169 – REAR PANEL ASSEMBLY

REF DES	RACAL-DANA P/N	DESCRIPTION	FSC	MANU P/N
C201	100111	CAP CERAM .01 MFD 2000 V	71471	HVD6-2KV
C202	100111	CAP CERAM .01 MFD 2000 V	71471	HVD6-2KV
C203	110125	CAP TANTA 2.2 MFD 35 V 20%	05397	T368B225M035AS
C204	110125	CAP TANTA 2.2 MFD 35 V 20%	05397	T368B225M035AS
B201	920790	FAN 50/60 HZ	27556	PWS2107FL
F201	920205	FUSE GLASS .75A 250 V	75915	3AG3/4ASB
J210	600808	CONN BNC	02660	31-010
J211	600586	POST, BINDING WHITE	32767	820-25
J214	600795	CONN VOLTAGE SELECTING & FUSED	95238	6J1
J215	600587	POST, BINDING BLACK	32767	820-45
S201	600912	SWITCH, SLIDE	79727	GF-323-440/G20-30/ G02-150
T201	300091	TRANSFORMER POWER, STEP DOWN	23095	14060
U201	230275	INTEGRATED CIRCUIT MC7805CT	04713	MC7805CT
U202	230275	INTEGRATED CIRCUIT MC7805CT	04713	MC7805CT

401602 – Assy., PCB, MOTHERBOARD

REF DES	RACAL-DANA P/N	DESCRIPTION					FSC	MANU P/N
C1	110151	CAP	TANTA	10 MFD	35 V	20%	05397	T362C106M035AS
C2	100017	CAP	CERAM	.01 MFD	100 V	20%	56289	C023B101F103M
C3	110151	CAP	TANTA	10 MFD	35 V	20%	05397	T362C106M035AS
C4	100113	CAP	CERAM	6800 PFD	1000 V	20%	56289	C012B102H682M
C5	100017	CAP	CERAM	.01 MFD	100 V	20%	56289	C023B101F103M
C6	100017	CAP	CERAM	.01 MFD	100 V	20%	56289	C023B101F103M
C8	110158	CAP	TANTA	10 MFD	50 V	10%	05397	T362C106K050AS
C9	110151	CAP	TANTA	10 MFD	35 V	20%	05397	T362C106M035AS
C10	100017	CAP	CERAM	.01 MFD	100 V	20%	56289	C023B101F103M
C12	110151	CAP	TANTA	10 MFD	35 V	20%	05397	T362C106M035AS
C13	110192	CAP	ELECT	1000 MFD	35 V			35TAL1000
C14	110192	CAP	ELECT	1000 MFD	35 V			35TAL1000
C15	110178	CAP	ELECT	47 MFD	100 V			100VBSL47
C16	110178	CAP	ELECT	47 MFD	100 V			100VBSL47
C17	110178	CAP	ELECT	47 MFD	100 V			100VBSL47
C18	110193	CAP	ELECT	100 MFD	50 V			See Description
C19	110151	CAP	TANTA	10 MFD	35 V	20%	05397	T362C106M035AS
C20	110151	CAP	TANTA	10 MFD	35 V	20%	05397	T362C106M035AS
C21	110194	CAP	ELECT	470 MFD	50 V	Radial Leads		See Description
C23	110151	CAP	TANTA	10 MFD	35 V	20%	05397	T362C106M035AS
C24	110193	CAP	ELEC	100 MFD	50 V			See description
C25	110158	CAP	TANTA	10 MFD	50 V	10%	05397	T362C106K050A
C26	110151	CAP	TANTA	10 MFD	35 V	20%	05397	T362C106M035AS
C27	110151	CAP	TANTA	10 MFD	35 V	20%	05397	T362C106M035AS
C28	110192	CAP	ELECT	1000 MFD	35 V			35TAL1000
C29	110151	CAP	TANTA	10 MFD	35 V	20%	05397	T362C106M035AS
C30	110194	CAP	ELECT	470 MFD	50 V	Radial Leads		See Description
C31	110174	CAP	ELECT	10,000 MFD	15 V			3050HS103U015244G
C32	110151	CAP	TANTA	10 MFD	35 V	20%	05397	T362C106M035AS
C33	110151	CAP	TANTA	10 MFD	35 V	20%	05397	T362C106M035AS
C34	100017	CAP	CERAM	.01 MFD	100 V	20%	56289	C023B101F103M
C35	100017	CAP	CERAM	.01 MFD	100 V	20%	56289	C023B101F103M
CR1	210004	DIODE	SILICO		1N4004		81349	1N4004
CR2	210004	DIODE	SILICO		1N4004		81349	1N4004
CR3	210004	DIODE	SILICO		1N4004		81349	1N4004
CR4	210004	DIODE	SILICO		1N4004		81349	1N4004
CR5	210004	DIODE	SILICO		1N4004		81349	1N4004
CR6	210004	DIODE	SILICO		1N4004		81349	1N4004
CR7	210004	DIODE	SILICO		1N4004		81349	1N4004
CR8	210004	DIODE	SILICO		1N4004		81349	1N4004
CR9	210004	DIODE	SILICO		1N4004		81349	1N4004
CR10	210070	DIODE	POWER	3 AMP	MR501		04713	MR501

401602 – Assy., PCB, MOTHERBOARD continued

REF DES	RACAL-DANA P/N	DESCRIPTION					FSC	MANU P/N
CR11	210070	DIODE	POWER	3 AMP	MR501		04713	MR501
CR12	210004	DIODE	SILICO		1N4004		81349	1N4004
CR13	210004	DIODE	SILICO		1N4004		81349	1N4004
CR14	210004	DIODE	SILICO		1N4004		81349	1N4004
CR15	210004	DIODE	SILICO		1N4004		81349	1N4004
CR16	220022	DIODE	SILICO, ZENER		1N965B		81349	1N965B
CR17	220035	DIODE	ZENER	16 V	1N966B	5%	81349	1N966B
CR18	210004	DIODE	SILICO		1N4004		81349	1N4004
CR19	210004	DIODE	SILICO		1N4004		81349	1N4004
CR20	210004	DIODE	SILICO		1N4004		81349	1N4004
CR21	210004	DIODE	SILICO		1N4004		81349	1N4004
CR22	210004	DIODE	SILICO		1N4004		81349	1N4004
CR23	210004	DIODE	SILICO		1N4004		81349	1N4004
CR24	210004	DIODE	SILICO		1N4004		81349	1N4004
CR25	210004	DIODE	SILICO		1N4004		81349	1N4004
CR26	210004	DIODE	SILICO		1N4004		81349	1N4004
CR27	210004	DIODE	SILICO		1N4004		81349	1N4004
CR28	210004	DIODE	SILICO		1N4004		81349	1N4004
CR29	210004	DIODE	SILICO		1N4004		81349	1N4004
J300	600733	CONN	25 P	Double Row			05574	3VH25/1JN5
OCI 2	250007	OPTICAL ISOLATOR					50579	1L-74
OCI 3	250006	HI SPEED OPTICAL ISOLATOR					50434	HP5082-4351
OCI 4	250006	HI SPEED OPTICAL ISOLATOR					50434	HP5082-4351
Q1	200183	TRANS	SILICO	PNP	MJE371		04713	MJE371
R2	000301	RES	CARBON	300 OHM		5% 1/4W	81349	RC07GF301J
R3	000102	RES	CARBON	1 K		5% 1/4W	81349	RC07GF102J
R4	000301	RES	CARBON	300 OHM		5% 1/4W	81349	RC07GF301J
R5	000301	RES	CARBON	300 OHM		5% 1/4W	81349	RC07GF301J
R6	000911	RES	CARBON	910 OHM		5% 1/4W	81349	RC07GF911J
R7	001752	RES	CARBON	240 OHM		5% 1W	21793	001752
R8	000104	RES	CARBON	100 K		5% 1/4W	81349	RC07GF104J
T1	300087	TRANS	PULSE				21793	300087
T2	300087	TRANS	PULSE				21793	300087
T3	300087	TRANS	PULSE				21793	300087
U1	230275	IC			MC7805CT		04713	MC7805CT
U2	230408	IC			MM74C165		27014	MM74C165
U4	230404	IC			MC14094BCP		04713	MC14094BCP
U5	230406	IC			MC1412P		04713	MC1412P

401602 – Assy., PCB, MOTHERBOARD continued

REF DES	RACAL-DANA P/N	DESCRIPTION	FSC	MANU P/N
U6	230194	IC SN74LS74N	01295	SN74LS74N
U7	230403	IC MM74C14N	27014	MM74C14N
U8	230406	IC MC1412P	04713	MC1412P
U9	230404	IC MC14094BCP	04713	MC14094BCP
U10	230330	IC 74LS367	01295	74LS367
U11	230393	IC MC7824T	04713	MC7824T
U12	230378	IC 7915CT	04713	7915CT
U13	230409	IC µA7924CT	27014	µA7924CT
U14	230275	IC MC7805CT	04713	MC7805CT
U15	230373	IC 7815CT	04713	7815CT
W1	600245	JUMPER INSULATED		L-2007-1LP
Z1	080012	RES CERMET 15 K Network 8P,7R 2%	11236	750-81-R15KΩ
Z2	080012	RES CERMET 15 K Network 8P,7R 2%	11236	750-81-R15KΩ
Z3	080020	RES CERMET 10 K Network 8P,7R 2%	11236	750-81-R10KΩ

404012 – Assy., CABLE, NON-VOLATILE MEMORY

REF DES	RACAL-DANA P/N	DESCRIPTION	FSC	MANU P/N
P11	600566	CONN 6 P	71785	251-06-30-160

401600 – Assy., PCB, DISPLAY

REF DES	RACAL-DANA P/N	DESCRIPTION					FSC	MANU P/N
C1	100017	CAP	CERAM	.01 MFD	100 V	20%	56289	C023B101F103M
C2	100017	CAP	CERAM	.01 MFD	100 V	20%	56289	C023B101F103M
C3	110126	CAP	TANTA	6.8 MFD	35 V	20%	05397	T368B685M035AS
C4	100017	CAP	CERAM	.01 MFD	100 V	20%	56289	C023B101F103M
C5	100017	CAP	CERAM	.01 MFD	100 V	20%	56289	C023B101F103M
C6	100017	CAP	CERAM	.01 MFD	100 V	20%	56289	C023B101F103M
CR1	210079	LAMP	HI EFFICIENCY, YELLOW	Solid State			50434	HP5082-4555
CR2	210079	LAMP	HI EFFICIENCY, YELLOW	Solid State			50434	HP5082-4555
CR3	210079	LAMP	HI EFFICIENCY, YELLOW	Solid State			50434	HP5082-4555
CR4	210079	LAMP	HI EFFICIENCY, YELLOW	Solid State			50434	HP5082-4555
CR5	210079	LAMP	HI EFFICIENCY, YELLOW	Solid State			50434	HP5082-4555
CR6	210071	LAMP	HI EFFICIENCY, RED	Solid State			50434	HP5082-4650
CR7	210071	LAMP	HI EFFICIENCY, RED	Solid State			50434	HP5082-4650
CR8	210071	LAMP	HI EFFICIENCY, RED	Solid State			50434	HP5082-4650
CR9	210071	LAMP	HI EFFICIENCY, RED	Solid State			50434	HP5082-4650
CR10	210071	LAMP	HI EFFICIENCY, RED	Solid State			50434	HP5082-4650
CR11	210071	LAMP	HI EFFICIENCY, RED	Solid State			50434	HP5082-4650
CR12	210071	LAMP	HI EFFICIENCY, RED	Solid State			50434	HP5082-4650
CR13	210079	LAMP	HI EFFICIENCY, YELLOW	Solid State			50434	HP5082-4555
CR14	210079	LAMP	HI EFFICIENCY, YELLOW	Solid State			50434	HP5082-4555
CR15	210079	LAMP	HI EFFICIENCY, YELLOW	Solid State			50434	HP5082-4555
CR16	210079	LAMP	HI EFFICIENCY, YELLOW	Solid State			50434	HP5082-4555
CR17	210079	LAMP	HI EFFICIENCY, YELLOW	Solid State			50434	HP5082-4555
CR18	210079	LAMP	HI EFFICIENCY, YELLOW	Solid State			50434	HP5082-4555
CR19	210079	LAMP	HI EFFICIENCY, YELLOW	Solid State			50434	HP5082-4555
CR20	210079	LAMP	HI EFFICIENCY, YELLOW	Solid State			50434	HP5082-4555
CR21	210079	LAMP	HI EFFICIENCY, YELLOW	Solid State			50434	HP5082-4555
CR22	210071	LAMP	HI EFFICIENCY, RED	Solid State			50434	HP5082-4650
CR23	210071	LAMP	HI EFFICIENCY, RED	Solid State			50434	HP5082-4650
CR24	210071	LAMP	HI EFFICIENCY, RED	Solid State			50434	HP5082-4650
CR25	210071	LAMP	HI EFFICIENCY, RED	Solid State			50434	HP5082-4650
CR26	210071	LAMP	HI EFFICIENCY, RED	Solid State			50434	HP5082-4650
CR27	210071	LAMP	HI EFFICIENCY, RED	Solid State			50434	HP5082-4650
LED 1	210074	DIODE	7 Segment LED DISPLAY, YELLOW				50434	HP5032-7660
LED 2	210074	DIODE	7 Segment LED DISPLAY, YELLOW				50434	HP5032-7660
LED 3	210074	DIODE	7 Segment LED DISPLAY, YELLOW				50434	HP5032-7660
LED 4	210074	DIODE	7 Segment LED DISPLAY, YELLOW				50434	HP5032-7660
LED 5	210074	DIODE	7 Segment LED DISPLAY, YELLOW				50434	HP5032-7660
LED 6	210074	DIODE	7 Segment LED DISPLAY, YELLOW				50434	HP5032-7660
LED 7	210074	DIODE	7 Segment LED DISPLAY, YELLOW				50434	HP5032-7660
LED 8	210074	DIODE	7 Segment LED DISPLAY, YELLOW				50434	HP5032-7660
LED 9	210074	DIODE	7 Segment LED DISPLAY, YELLOW				50434	HP5032-7660

401600 – Assy., PCB, DISPLAY continued

REF DES	RACAL-DANA P/N	DESCRIPTION	FSC	MANU P/N
P1	600280	CONN 12 P	71785	252-12-30-160
U1	230510	IC 74LS164		74LS164
U2	230510	IC 74LS164		74LS164
U3	230510	IC 74LS164		74LS164
U4	230510	IC 74LS164		74LS164
U5	230510	IC 74LS164		74LS164
U6	230510	IC 74LS164		74LS164
U7	230510	IC 74LS164		74LS164
U8	230510	IC 74LS164		74LS164
U9	230510	IC 74LS164		74LS164
U10	230510	IC 74LS164		74LS164
U11	230330	IC 74LS367	01295	74LS367
U12	230192	IC SN74LS05N	01295	SN74LS05N
Z1	080026	RES ARRAY 100 OHMS 13R TO COMMON PIN	27014	RA-13-100N
Z2	080028	RES ARRAY 150 OHMS 13R TO COMMON PIN	27014	RA-13-150N
Z3	080027	RES ARRAY 120 OHMS 8R IN DIP	27014	RA-08-120N
Z4	080027	RES ARRAY 120 OHMS 8R IN DIP	27014	RA-08-120N
Z5	080027	RES ARRAY 120 OHMS 8R IN DIP	27014	RA-08-120N
Z6	080027	RES ARRAY 120 OHMS 8R IN DIP	27014	RA-08-120N
Z7	080027	RES ARRAY 120 OHMS 8R IN DIP	27014	RA-08-120N
Z8	080027	RES ARRAY 120 OHMS 8R IN DIP	27014	RA-08-120N
Z9	080005	RES CERMET 10 K Network 6P.5R 2%	11236	750-61-R10KΩ
Z10	080027	RES ARRAY 120 OHMS 8R IN DIP	27014	RA-08-120N

404015 – MODULE ASSY., CALIBRATION

REF DES	RACAL-DANA P/N	DESCRIPTION		FSC	MANU P/N
J101	600587	POST, BINDING	BLACK	32767	820-45
J102	600586	POST, BINDING	WHITE	32767	820-25
J103	600587	POST, BINDING	BLACK	32767	820-45
J104	600586	POST, BINDING	WHITE	32767	820-25
J105	600587	POST, BINDING	BLACK	32767	820-45
J201	600586	POST, BINDING	WHITE	32767	820-25
J202	600587	POST, BINDING	BLACK	32767	820-45
J203	600587	POST, BINDING	BLACK	32767	820-45
J204	600586	POST, BINDING	WHITE	32767	820-25
J205	600587	POST, BINDING	BLACK	32767	820-45
J206	600586	POST, BINDING	WHITE	32767	820-25
J207	600587	POST, BINDING	BLACK	32767	820-45
P308	600944	CONN	3S1P	81312	JF1P-3SB
S126	600910	SWITCH, MINIATURE		79727	GF-126-DP-DT
S127	600910	SWITCH, MINIATURE		79727	GF-126-DP-DT

401608 – Assy., PCB, ATTENUATOR REFERENCE

REF DES	RACAL-DANA P/N	DESCRIPTION					FSC	MANU P/N
AR1	230191	IC			(OP-07CJ)		06665	TO-99(J)MONO
AR2	230103	IC			LM308		27014	LM308
C1	110126	CAP	TANTA	6.8 MFD	35 V	20%	05397	T368B685M035AS
C2	110126	CAP	TANTA	6.8 MFD	35 V	20%	05397	T368B685M035AS
C3	100113	CAP	CERAM	6800 PFD	1000 V	20%	56289	C023B102H682M
C4	100017	CAP	CERAM	.01 MFD	100 V	20%	56289	C023B101F103M
C5	120308	CAP	POLY	.047 MFD	250 V	10%	73445	C280MAE/A47K
C6	110126	CAP	TANTA	6.8 MFD	35 V	20%	05397	T368B685M035AS
C7	100068	CAP	CERAM	.02 MFD	100 V	20%	56289	C023B101H203M
C10	120290	CAP	MYLAR	.22 MFD	100 V	20%	73455	C281AH/A220K
C11	110126	CAP	TANTA	6.8 MFD	35 V	20%	05397	T368B685M035AS
C12	110126	CAP	TANTA	6.8 MFD	35 V	20%	05397	T368B685M035AS
C13	110126	CAP	TANTA	6.8 MFD	35 V	20%	05397	T368B685M035AS
C14	100012	CAP	CERAM	33 PFD	500 V	10%	71471	TCD-DI-1(N750)
C15	120290	CAP	MYLAR	.22 MFD	100 V	20%	73445	C281AH/A220K
CR3	220004	DIODE	SILICO, ZENER		1N961B		81349	1N961B
CR4	220004	DIODE	SILICO, ZENER		1N961B		81349	1N961B
CR5	220085	DIODE	ZENER		TVS515		12969	TVS515
CR6	220085	DIODE	ZENER		TVS515		12969	TVS515
E9	600766	EYELET	TEFLON				98291	X-121973-1
E10	600766	EYELET	TEFLON				98291	X-121973-1
E11	600766	EYELET	TEFLON				98291	X-121973-1
E12	600766	EYELET	TEFLON				98291	X-121973-1
E13	600766	EYELET	TEFLON				98291	X-121973-1
E14	600766	EYELET	TEFLON				98291	X-121973-1
E15	600766	EYELET	TEFLON				98291	X-121973-1
E16	600766	EYELET	TEFLON				98291	X-121973-1
E17	600766	EYELET	TEFLON				98291	X-121973-1
E18	600766	EYELET	TEFLON				98291	X-121973-1
J308	600943	CONN		3P1S			81312	JF1S-3PB
K1	310112	RELAY	REED	28 V			26806	AZ421-467-204
K2	310112	RELAY	REED	28 V			26806	AZ421-467-204
K3	310112	RELAY	REED	28 V			26806	AZ421-467-204
K4	310112	RELAY	REED	28 V			26806	AZ421-467-204
K5	310111	RELAY	REED	28 V			26806	AZ420-467-202
K6	310111	RELAY	REED	28 V			26806	AZ420-467-202
K7	310111	RELAY	REED	28 V			26806	AZ420-467-202

REF DES	RACAL-DANA P/N	DESCRIPTION	FSC	MANU P/N
Q1	200088	DIODE SILICO PNP 2N4248	80131	2N4248
Q2	200200	DIODE NPN 200200	21793	200200
Q3	200200	DIODE NPN 200200	21793	200200
Q4	200200	DIODE NPN 200200	21793	200200
Q5	200200	DIODE NPN 200200	21793	200200
Q6	200200	DIODE NPN 200200	21793	200200
R1	020640	RES WW ATTENUATOR SET	21793	020640
R2	020640	RES WW ATTENUATOR SET	21793	020640
R3	020640	RES WW ATTENUATOR SET	21793	020640
R4	020640	RES WW ATTENUATOR SET	21793	020640
R5	020640	RES WW ATTENUATOR SET	21793	020640
R6	010871	RES 5 K Matched Set	21793	010871
R7	000133	RES CARBON 13 K 5% 1/4W	81349	RC07GF133J
R8	000100	RES CARBON 10 OHM 5% 1/4W	81349	RC07GF100J
R9	010646	RES METAL 2.49 K 1% 1/10W	81349	RN55C2491F
R10	010871	RES 5 K Matched Set	21793	010871
R11	000162	RES CARBON 1.6 K 5% 1/4W	81349	RC07GF162J
R12	000103	RES CARBON 10 K 5% 1/4W	81349	RC07GF103J
R15	010770	RES METAL 45.0097 K .01%	18612	HP202
R16	010769	RES METAL 4.5 K .01%	18612	HP202
R17	012037	RES METAL 69 OHM .1%	18612	HP202
R18	010790	RES METAL 36.5 K 1% 1/10W	81349	RN55E3652F
R19	000206	RES CARBON 20 M 5% 1/4W	81349	RC07GF206J
R20	000102	RES CARBON 1 K 5% 1/4W	81349	RC07GF102J
R21	010529	RES METAL 10 K 1% 1/10W	81349	RN55C1002F
R22	020716	RES WW 10 K .1% .05W	22045	J90
R23	000202	RES CARBON 2 K 5% 1/4W	81349	RC07GF202J
R24	000103	RES CARBON 10 K 5% 1/4W	81349	RC07GF103J
R25	000390	RES CARBON 39 OHM 5% 1/4W	81349	RC07GF390J
R26	010616	RES METAL 50 K .1% 1/10W	81349	RN55C5002B
R27	012051	RES METAL 431 OHM .1%	18612	HP202
R28	020640	RES WW ATTENUATOR SET	21793	020640
R29	030015	RES WW 100 K 1% 10W	21551	M100
R30	040235	POT CERMET 100 K 10% 3/4W	73138	89PR100K
R31	010790	RES METAL 36.5 K 1% 1/10W	81349	RN55E3652F
R32	040235	POT CERMET 100 K 10% 3/4W	73138	89PR100K
R33	000102	RES CARBON 1 K 5% 1/4W	81349	RC07GF102J
R34	000100	RES CARBON 10 OHM 5% 1/4W	81349	RC07GF100J
R36	000102	RES CARBON 1 K 5% 1/4W	81349	RC07GF102J
R37	000101	RES CARBON 100 OHM 5% 1/4W	81349	RC07GF101J
R38	000101	RES CARBON 100 OHM 5% 1/4W	81349	RC07GF101J
SG1	920821	SPARK GAP	25088	B1-A230
TP1	600786	POST, MACHINE APPLIED STRIP	00779	1-87022-0
TP2	600786	POST, MACHINE APPLIED STRIP	00779	1-87022-0

401608 – Assy., PCB, ATTENUATOR REFERENCE continued

REF DES	RACAL-DANA P/N	DESCRIPTION	FSC	MANU P/N
TP3	600786	POST, MACHINE APPLIED STRIP	00779	1-87022-0
TP4	600786	POST, MACHINE APPLIED STRIP	00779	1-87022-0
TP5	600786	POST, MACHINE APPLIED STRIP	00779	1-87022-0
U1	230406	IC MC1412P	04713	MC1412P
U2	230612	IC DIGITAL CD4094	02735	CD4094

403916 – Assy., PCB, 10V REFERENCE

REF DES	RACAL-DANA P/N	DESCRIPTION	FSC	MANU P/N
AR1	230127	INTEGRATED CIRCUIT SSS725C	06665	SSS725C
CR1	403686	RESISTOR SET ASSEMBLY	21793	403686
Q1	200196	TRANS NPN 2N3568	81349	2N3568
Q2	200200	TRANS NPN 200200	21793	200200
R1	403686	RESISTOR SET ASSEMBLY	21793	403686
R2	020641	RES WW 10 K 1% .05W	22045	J90
R3	040232	POT CERMET 10 K 10%	73138	89PR10K
R4	040235	POT CERMET 100 K 10% 3/4W	73138	89PR100K
R5	040236	POT CERMET 200 K 10%	73138	89PR200K
R6	000565	RES CARBON 5.6 M 5% 1/4W	81349	RC07GF565J
R7	010774	RES METAL 3.7 K .1%	18612	V53-1
R8	010773	RES METAL 6.3 K .1%	18612	V53-1
R9	403686	RESISTOR SET ASSEMBLY	21793	403686
R10	403686	RESISTOR SET ASSEMBLY	21793	403686
R11	010879	RES METAL 1 M 1% 1/10W	81349	RN55D1004F
R12	012007	RES METAL 23.2 K (Nom) FSV 1% (RN55C)	21793	012007

401611 – Assy., PCB, INTERCONNECTION

REF DES	RACAL-DANA P/N	DESCRIPTION					FSC	MANU P/N
C1	100017	CAP	CERAM	.01 MFD	100 V	20%	56289	C023B101F103M
C2	100017	CAP	CERAM	.01 MFD	100 V	20%	56289	C023B101F103M
C3	100017	CAP	CERAM	.01 MFD	100 V	20%	56289	C023B101F103M
C4	100022	CAP	CERAM	2000 PFD	1000 V	10%	56289	10SS-D20
C5	100113	CAP	CERAM	6800 PFD	1000 V	20%	56289	C023B102H682M
C6	100017	CAP	CERAM	.01 MFD	100 V	20%	56289	C023B101F103M
J301	600228	CONN		18 P			71785	252-18-30-160
J302	600280	CONN		12 P			71785	252-12-30-160
J303	600280	CONN		12 P			71785	252-12-30-160
J304	600280	CONN		12 P			71785	252-12-30-160
J305	600671	CONN		6 P			71785	252-06-30-160
J306	600280	CONN		12 P			71785	252-12-30-160
J307	600670	CONN		10 P			71785	252-10-30-160
Q1	200088	TRANS	SILICO	PNP	2N4248		80131	2N4248
Q2	200200	TRANS		NPN	200200		21793	200200
R1	000104	RES	CARBON	100 K		5% 1/4W	81349	RC07GF104J
R2	000683	RES	CARBON	68 K		5% 1/4W	81349	RC07GF683J
R3	000204	RES	CARBON	200 K		5% 1/4W	81349	RC07GF204J
R4	000102	RES	CARBON	1 K		5% 1/4W	81349	RC07GF102J
R5	000203	RES	CARBON	20 K		5% 1/4W	81349	RC07GF203J
R6	000473	RES	CARBON	47 K		5% 1/4W	81349	RC07GF473J
R7	000472	RES	CARBON	4.7 K		5% 1/4W	81349	RC07GF472J
R8	000153	RES	CARBON	15 K		5% 1/4W	81349	RC07GF153J
R9	000223	RES	CARBON	22 K		5% 1/4W	81349	RC07GF223J
U1	230408	IC			MM74C165		27014	MM74C165
U2	230405	IC			MC14528BCP		04713	MC14528BCP
U3	230612	IC	DIGITAL		CD4094 4BCP		02735	CD4094 4BCP
U4	230406	IC			MC1412P		04713	MC1412P
Z1	080030	RES	CERMET	22 K Network		8P,7R 2%	11236	750-81-R22KΩ

401613 – Assy., PCB, NON-VOLATILE MEMORY

REF DES	RACAL-DANA P/N	DESCRIPTION					FSC	MANU P/N
C1	100017	CAP	CERAM	.01 MFD	100 V	20%	56289	C023B101F103M
C2	110126	CAP	TANTA	6.8 MFD	35 V	20%	05397	T368B685M035AS
C3	100071	CAP	CERAM	.001 MFD	1000 V	20%	56289	C023B102E102M
C4	110126	CAP	TANTA	6.8 MFD	35 V	20%	05397	T368B685M035AS
C5	100017	CAP	CERAM	.01 MFD	100 V	20%	56289	C023B101F103M
C6	110126	CAP	TANTA	6.8 MFD	35 V	20%	05396	T368B685M035AS
C7	120001	CAP	MYLAR	.0033 MFD	100 V	10%	09023	WMF1D33
C8	100017	CAP	CERAM	.01 MFD	1000 V	20%	56289	C023B101F103M
CR1	211083	DIODE	SILICO		1N916B		81349	1N916B
CR2	211083	DIODE	SILICO		1N916B		81349	1N916B
CR3	211083	DIODE	SILICO		1N916B		81349	1N916B
CR4	211083	DIODE	SILICO		1N916B		81349	1N916B
Q1	200088	TRANS	SILICO	PNP	2N4258		80131	2N4258
Q2	200088	TRANS	SILICO	PNP	2N4258		80131	2N4258
Q3	200088	TRANS	SILICO	PNP	2N4258		80131	2N4258
Q4	200088	TRANS	SILICO	PNP	2N4258		80131	2N4258
Q5	200200	TRANS		NPN	200200		21793	200200
Q6	200101	TRANS		FET	2N5245		81349	2N5245
Q7	200088	TRANS	SILICO	PNP	2N4248		80131	2N4248
Q8	200088	TRANS	SILICO	PNP	2N4248		80131	2N4248
R1	000182	RES	CARBON	1.8 K		5% 1/4W	81349	RC07GF182J
R2	000103	RES	CARBON	10 K		5% 1/4W	81349	RC07GF103J
R3	000204	RES	CARBON	200 K		5% 1/4W	81349	RC07GF204J
R4	000103	RES	CARBON	10 K		5% 1/4W	81349	RC07GF103J
R5	000204	RES	CARBON	200 K		5% 1/4W	81349	RC07GF204J
R6	000103	RES	CARBON	10 K		5% 1/4W	81349	RC07GF103J
R7	000103	RES	CARBON	10 K		5% 1/4W	81349	RC07GF103J
R8	000103	RES	CARBON	10 K		5% 1/4W	81349	RC07GF103J
R9	000913	RES	CARBON	91 K		5% 1/4W	81349	RC07GF913J
R10	000182	RES	CARBON	1.8 K		5% 1/4W	81349	RC07GF182J
R11	000163	RES	CARBON	16 K		5% 1/4W	81349	RC07GF163J
R12	000103	RES	CARBON	10 K		5% 1/4W	81349	RC07GF103J
U1	230356	IC			74LS175		27014	74LS175
U2	230196	IC			SN74LS51N		01295	SN74LS51N
U3	230193	IC			SN74LS00N		01295	SN74LS00N
U4	230558	IC	MEMORY	2048X8 PROM			21793	230558
U5	230330	IC			74LS367		01295	74LS367

401613 – Assy., PCB, NON-VOLATILE MEMORY continued

REF DES	RACAL-DANA P/N	DESCRIPTION					FSC	MANU P/N
U6	230363	IC			LM555CN		27014	LM555CN
Z1	080009	RES	CERMET	6.8 K	Network	16P,8R 2%	11236	761-3-R6.8KΩ
Z2	080004	RES	CERMET	4.7 K	Network	6P,5R 2%	11236	750-61-R4.7KΩ
Z3	080014	RES	CERMET	15 K	Network	6P,5R 2%	11236	750-61-R15KΩ
Z4	080023	RES	CERMET	4.7 K	Network	8P,7R	11236	750-81-R4.7KΩ

401609 – Assy., PCB, DIGITIZER

REF DES	RACAL-DANA P/N	DESCRIPTION					FSC	MANU P/N
AR1	230415	IC	HI VOLTAGE OP AMP		LM343H		27014	LM343H
C1	101644	CAP	CERAM	200 PFD	1000 V	20%	71471	GPDX5F201K
C2	101642	CAP	CERAM	150 PFD	500 V	10%	71471	SCD1X5F
C3	120326	CAP	MYLAR	1.0 MFD	50 V	5%	12406	PD5B105J
C4	120343	CAP	MYLAR	1 MFD	50 V	10%	27556	Z5R105K
C5	110127	CAP	TANTA	22 MFD	6 V	20%	05397	T368B226M006AS
C6	100017	CAP	CERAM	.01 MFD	100 V	20%	56289	C023B101F103M
C7	110127	CAP	TANTA	22 MFD	6 V	20%	05397	T368B226M006AS
C8	101644	CAP	CERAM	200 PFD	1000 V	20%	71471	GPDX5F201K
C9	110126	CAP	TANTA	6.8 MFD	35 V	20%	05397	T368B685M035AS
C10	110125	CAP	TANTA	2.2 MFD	35 V	20%	05397	T368B225M035AS
C11	100068	CAP	CERAM	.02 MFD	100 V	20%	56289	C023B101H203M
C12	110139	CAP	TANTA	.22 MFD	35 V	20%	05397	T368A224M035AS
C13	101642	CAP	CERAM	150 PFD	500 V	10%	71471	SCD1X5F
C14	101642	CAP	CERAM	150 PFD	500 V	10%	71471	SCD1X5F
C15	100017	CAP	CERAM	.01 MFD	100 V	20%	56289	C023B101F103M
C16	101641	CAP	CERAM	470 PFD	500 V	10%	71471	SCD1X5F
C17	101098	CAP	CERAM	330 PFD	500 V	10%	56289	10TS-T33
C18	101174	CAP	CERAM	.001 MFD	500 V	10%	04222	SCD-DI-2X5F-1000
C19	100017	CAP	CERAM	.01 MFD	100 V	20%	56289	C023B101F103M
C20	110126	CAP	TANTA	6.8 MFD	35 V	20%	05397	T368B685M035AS
C21	110158	CAP	TANTA	10 MFD	50 V	10%	05397	T362C106K050A
C22	101644	CAP	CERAM	200 PFD	1000 V	20%	71471	GPDX5F201K
C23	100018	CAP	CERAM	120 PFD	500 V	10%	71471	ETCD(N5600)
C24	100100	CAP	CERAM	FSV			21793	100100
C25	101175	CAP	POLY	220 PFD	500 V	10%	71471	SCD1X5F
C26	100017	CAP	CERAM	.01 MFD	100 V	20%	56289	C023B101F103M
C29	101642	CAP	CERAM	150 PFD	500 V	10%	71471	SCD1X5F
C30	120343	CAP	MYLAR	1 MFD	50 V	10%	27556	Z5R105K
C32	100017	CAP	CERAM	.01 MFD	100 V	20%	56289	C023B101F103M
CR2	211083	DIODE	SILICO		1N916B		81349	1N916B
CR3	211083	DIODE	SILICO		1N916B		81349	1N916B
CR4	211083	DIODE	SILICO		1N916B		81349	1N916B
CR5	211083	DIODE	SILICO		1N916B		81349	1N916B

401609 – Assy., PCB, DIGITIZER continued

REF DES	RACAL-DANA P/N	DESCRIPTION					FSC	MANU P/N
CR6	211083	DIODE	SILICO		1N916B		81349	1N916B
CR7	211083	DIODE	SILICO		1N916B		81349	1N916B
CR8	211083	DIODE	SILICO		1N916B		81349	1N916B
CR9	211083	DIODE	SILICO		1N916B		81349	1N916B
CR10	211083	DIODE	SILICO		1N916B		81349	1N916B
CR11	211083	DIODE	SILICO		1N916B		81349	1N916B
CR12	211083	DIODE	SILICO		1N916B		81349	1N916B
CR13	211083	DIODE	SILICO		1N916B		81349	1N916B
CR14	211083	DIODE	SILICO		1N916B		81349	1N916B
CR15	220059	DIODE	ZENER	33 V	1N973B	5%	81349	1N973B
CR16	220054	DIODE	ZENER		1N5260B		81349	1N5260B
CR17	220031	DIODE	SILICO, ZENER	3.3 V	1/4M3.3AZ5		04713	1/4M3.3AZ5
CR18	220031	DIODE	SILICO, ZENER	3.3 V	1/4M3.3AZ5		04713	1/4M3.3AZ5
CR19	211083	DIODE	SILICO		1N916B		81349	1N916B
CR20	211083	DIODE	SILICO		1N916B		81349	1N916B
CR21	211083	DIODE	SILICO		1N916B		81349	1N916B
CR22	211083	DIODE	SILICO		1N916B		81349	1N916B
K1	310139	RELAY	MAGNETIC REED		1 Form A		21317	RR10-1259
Q1	200037	TRANS	SILICO	NPN	2N3646		80131	2N3646
Q2	200037	TRANS	SILICO	NPN	2N3646		80131	2N3646
Q3	200037	TRANS	SILICO	NPN	2N3646		80131	2N3646
Q4	200037	TRANS	SILICO	NPN	2N3646		80131	2N3646
Q7	200160	TRANS		FET	E-304		17856	E-304
Q8	200161	TRANS		Dual FET	E-415		17856	E-415
Q9	200068	TRANS		PNP	2N4250		80131	2N4250
Q10	200203	TRANS		FET	E-201		17856	E-201
Q11	200160	TRANS		FET	E-304		17856	E-304
Q12	200037	TRANS	SILICO	NPN	2N3646		80131	2N3646
Q13	200099	TRANS		PNP	2N4258		81349	2N4258
Q14	200037	TRANS	SILICO	NPN	2N3646		80131	2N3646
Q15	200201	TRANS		Dual NPN	200201		21793	200201
Q16	200160	TRANS		FET	E-304		17856	E-304
Q17	200200	TRANS		NPN	200200		21793	200200
Q18	200203	TRANS		FET	E-201		17856	E-201
Q19	200088	TRANS	SILICO	PNP	2N4248		80131	2N4248
Q20	200088	TRANS	SILICO	PNP	2N4248		80131	2N4248

401609 – Assy., PCB, DIGITIZER continued

REF DES	RACAL-DANA P/N	DESCRIPTION					FSC	MANU P/N
Q21	200162	TRANS		FET	KE4391		21793	200162
Q22	200162	TRANS		FET	KE4391		21793	200162
Q23	200179	TRANS		FET	KE4391		27014	KE4391
Q24	200088	TRANS	SILICO	PNP	2N4248		80131	2N4248
Q25	200224	TRANS		NPN	(Selected 200200)		21793	200224
Q26	200088	TRANS	SILICO	PNP	2N4248		80131	2N4248
Q27	200224	TRANS		NPN	(Selected 200200)		21793	200224
Q28	200245	TRANS		PNP	MPS-A92		04713	MPS-A92
Q29	200088	TRANS	SILICO	PNP	2N4248		80131	2N4248
Q30	200200	TRANS		NPN	200200		21793	200200
Q31	200224	TRANS		NPN	(Selected 200200)		21793	200224
Q32	200088	TRANS	SILICO	PNP	2N4248		80131	2N4248
Q33	200088	TRANS	SILICO	PNP	2N4248		80131	2N4248
Q34	200200	TRANS		NPN	200200		21793	200200
Q35	200088	TRANS	SILICO	PNP	2N4248		80131	2N4248
Q36	200200	TRANS		NPN	200200		21793	200200
Q37	200088	TRANS	SILICO	PNP	2N4248		80131	2N4248
Q38	200200	TRANS		NPN	200200		21793	200200
R1	000153	RES	CARBON	15 K		5% 1/4W	81349	RC07GF153J
R2	000272	RES	CARBON	2.7 K		5% 1/4W	81349	RC07GF272J
R3	000152	RES	CARBON	1.5 K		5% 1/4W	81349	RC07GF152J
R4	000153	RES	CARBON	15 K		5% 1/4W	81349	RC07GF153J
R5	000511	RES	CARBON	510 OHM		5% 1/4W	81349	RC07GF511J
R6	000511	RES	CARBON	510 OHM		5% 1/4W	81349	RC07GF511J
R7	000511	RES	CARBON	510 OHM		5% 1/4W	81349	RC07GF511J
R8	000272	RES	CARBON	2.7 K		5% 1/4W	81349	RC07GF272J
R10	010013	RES	METAL	60.4 K	T-2	1% 1/8W	81349	RN60C6042F
R12	010868	RES	METAL	14.3 K		1% 1/10W	81349	RN55D1432F
R13	010169	RES	METAL	100 K	T-0	1% 1/8W	81349	RN60D1003F
R14	010059	RES	METAL	20 K	T-0	1% 1/8W	81349	RN60D2002F
R15	010502	RES	METAL	249 K		1% 1/8W	81349	RN60D2493F
R16	010536	RES	METAL	100 K		1% 1/10W	81349	RN55C1003F
R17	010918	RES	METAL	499 OHM		1% 1/10W	81349	RN55C4990F
R18	000473	RES	CARBON	47 K		5% 1/4W	81349	RC07GF473J
R19	010013	RES	METAL	60.4 K	T-2	1% 1/8W	81349	RN60C6042F
R20	000180	RES	CARBON	18 OHM		5% 1/4W	81349	RC07GF180J
R21	000511	RES	CARBON	18 OHM		5% 1/4W	81349	RC07GF180J
R22	000393	RES	CARBON	39 K		5% 1/4W	81349	RC07GF393J

401609 – Assy., PCB, DIGITIZER continued

REF DES	RACAL-DANA P/N	DESCRIPTION				FSC	MANU P/N
R23	010621	RES	METAL	49.9 K	1% 1/10W	81349	RN55C4992F
R24	010621	RES	METAL	49.9 K	1% 1/10W	81349	RN55C4992F
R25	000104	RES	CARBON	100 K	5% 1/4W	81349	RC07GF104J
R26	000272	RES	CARBON	2.7 K	5% 1/4W	81349	RC07GF272J
R27	000153	RES	CARBON	15 K	5% 1/4W	81349	RC07GF153J
R28	000510	RES	CARBON	51 OHM	5% 1/4W	81349	RC07GF510J
R29	000101	RES	CARBON	100 OHM	5% 1/4W	81349	RC07GF101J
R30	010533	RES	METAL	28.7 K	1% 1/10W	81349	RN55C2872F
R31	000103	RES	CARBON	10 K	5% 1/4W	81349	RC07GF103J
R32	000153	RES	CARBON	15 K	5% 1/4W	81349	RC07GF153J
R33	000153	RES	CARBON	15 K	5% 1/4W	81349	RC07GF153J
R34	000200	RES	CARBON	20 OHM	5% 1/4W	81349	RC07GF200J
R35	000513	RES	CARBON	51 K	5% 1/4W	81349	RC07GF513J
R36	000512	RES	CARBON	5.1 K	5% 1/4W	81349	RC07GF512J
R37	000103	RES	CARBON	10 K	5% 1/4W	81349	RC07GF103J
R38	000152	RES	CARBON	1.5 K	5% 1/4W	81349	RC07GF152J
R39	000332	RES	CARBON	3.3 K	5% 1/4W	81349	RC07GF332J
R40	000392	RES	CARBON	3.9 K	5% 1/4W	81349	RC07GF392J
R41	000202	RES	CARBON	2 K	5% 1/4W	81349	RC07GF202J
R42	000104	RES	CARBON	100 K	5% 1/4W	81349	RC07GF104J
R43	000104	RES	CARBON	100 K	5% 1/4W	81349	RC07GF104J
R44	000302	RES	CARBON	3 K	5% 1/4W	81349	RC07GF302J
R45	000152	RES	CARBON	1.5 K	5% 1/4W	81349	RC07GF152J
R46	000152	RES	CARBON	1.5 K	5% 1/4W	81349	RC07GF152J
R47	000202	RES	CARBON	2 K	5% 1/4W	81349	RC07GF202J
R48	000302	RES	CARBON	3 K	5% 1/4W	81349	RC07GF302J
R49	000104	RES	CARBON	100 K	5% 1/4W	81349	RC07GF104J
R50	000104	RES	CARBON	100 K	5% 1/4W	81349	RC07GF104J
R51	000104	RES	CARBON	100 K	5% 1/4W	81349	RC07GF104J
R52	000202	RES	CARBON	2 K	5% 1/4W	81349	RC07GF202J
R53	000103	RES	CARBON	10 K	5% 1/4W	81349	RC07GF103J
R54	000103	RES	CARBON	10 K	5% 1/4W	81349	RC07GF103J
R55	000101	RES	CARBON	100 OHM	5% 1/4W	81349	RC07GF101J
R56	000101	RES	CARBON	100 OHM	5% 1/4W	81349	RC07GF101J
R57	000273	RES	CARBON	27 K	5% 1/4W	81349	RC07GF273J
R58	001737	RES	CARBON	FSV	5% 1/4W	21793	001737
R59	000107	RES	CARBON	100 M	5% 1/4W	81349	RC07GF107J
R60	000104	RES	CARBON	100 K	5% 1/4W	81349	RC07GF104J
R61	001737	RES	CARBON	FSV	5% 1/4W	21793	001737
R62	000512	RES	CARBON	5.1 K	5% 1/4W	81349	RC07GF512J
R63	000208	RES	CARBON	2000 M	20% 1/4W	01121	CB2082

401609 – Assy., PCB, DIGITIZER continued

REF DES	RACAL-DANA P/N	DESCRIPTION	FSC	MANU P/N
R64	000686	RES CARBON 68 M 5% 1/4W	81349	RC07GF686J
R65	000106	RES CARBON 10 M 5% 1/4W	81349	RC07GF106J
R66	000225	RES CARBON 2.2 M 5% 1/4W	81349	RC07GF225J
R67	000511	RES CARBON 510 OHM 5% 1/4W	81349	RC07GF511J
R68	010520	RES METAL 21.5 K 1% 1/8W	81349	RN60D2152F
R69	000750	RES CARBON 75 OHM 5% 1/4W	81349	RC07GF750J
R70	000392	RES CARBON 3.9 K 5% 1/4W	81349	RC07GF392J
R71	000511	RES CARBON 510 OHM 5% 1/4W	81349	RC07GF511J
R72	000392	RES CARBON 3.9 K 5% 1/4W	81349	RC07GF392J
R73	000361	RES CARBON 360 OHM 5% 1/4W	81349	RC07GF361J
R74	001759	RES CARBON 5.1 OHM 5% 1/4W	81349	RC07GF5R1J
R75	040255	POT CERMET 10 OHM 20% .5W	73138	72XW10
T1	300087	TRANSFORMER, PULSE	21793	300087
T2	300087	TRANSFORMER, PULSE	21793	300087
T3	300087	TRANSFORMER, PULSE	21793	300087
TP1	600786	POST, MACHINE APPLIED STRIP	00779	1-87022-0
TP2	600786	POST, MACHINE APPLIED STRIP	00779	1-87022-0
TP3	600786	POST, MACHINE APPLIED STRIP	00779	1-87022-0
TP4	600786	POST, MACHINE APPLIED STRIP	00779	1-87022-0
TP5	600786	POST, MACHINE APPLIED STRIP	00779	1-87022-0
U1	230193	IC SN74LS00N	01295	SN74LS00N
U2	230193	IC SN74LS00N	01295	SN74LS00N
W1	600245	JUMPER, INSULATED		L-2007-1LP

401605 – Assy., PCB, ISOLATOR

REF DES	RACAL-DANA P/N	DESCRIPTION					FSC	MANU P/N
C1	120313	CAP	POLY	.15 MFD	200 V	5%	27556	PA2C154J
C2	120271	CAP	POLY	.5 MFD	50 V	5%	27556	PV2A504J
C3	101098	CAP	CERAM	330 PFD	500 V	10%	56289	10TS-T33
C4	101099	CAP	CERAM	680 PFD	1000 V	10%	71471	SCD2X5F
C5	120004	CAP	POLY	.001 MFD	500 V	5%	08257	KSO Series
C6	100040	CAP	CERAM	200 PFD	1000 V	20%	56289	C023B102E201M
C7	121147	CAP	MYLAR	.0068 MFD	100 V	10%	09023	WMF1D68
C8	121394	CAP	MYLAR	.15 MFD	100 V	10%	09023	WMF1P15
C9	120313	CAP	POLY	.15 MFD	200 V	5%	27556	PA2C154J
C10	121092	CAP	MYLAR	.0022 MFD	100 V	10%	09023	WFF1D22
C11	100032	CAP	MICA	1300 PFD	100 V		72136	DM19F132J
C12	101145	CAP	CERAM	100 PFD	500 V	10%	04222	TCD-DI-1N5600-100
C13	110129	CAP	TANTA	.1 MFD	35 V	20%	05397	T368A104M035AS
C14	100012	CAP	CERAM	33 PFD	500 V	10%	71471	TCD-DI-1(N750)
C15	121147	CAP	MYLAR	.0068 PFD	100 V	10%	09023	WMF1D68
C16	100012	CAP	CERAM	33 PFD	500 V	10%	71471	TCD-DI-1(N750)
C17	110126	CAP	TANTA	6.8 MFD	35 V	20%	05397	T368B685M035AS
C18	110126	CAP	TANTA	6.8 MFD	35 V	20%	05397	T368B685M035AS
C19	100012	CAP	CERAM	33 PFD	500 V	10%	71471	TCD-DI-1(N750)
C21	101182	CAP	CERAM	47 PFD	500 V	10%	71471	TCD-DI-2(N750)
C22	101182	CAP	CERAM	47 PFD	500 V	10%	71471	TCD-DI-2(N750)
C23	100017	CAP	CERAM	.01 MFD	100 V	20%	56289	C023B101F103M
C24	100017	CAP	CERAM	.01 MFD	100 V	20%	56289	C023B101F103M
C25	110129	CAP	TANTA	.1 MFD	35 V	20%	05397	T368A104M035AS
C27	100012	CAP	CERAM	33 PFD	500 V	10%	71471	TCD-DI-1(N750)
C30	101145	CAP	CERAM	100 PFD	500 V	10%	04222	TCD-DI-1N5600-100
AR1	230411	IC	OP AMP		LM201A-H		27014	LM201A-H
AR2	230103	IC			LM308		27014	LM308
AR3	230054	IC			LM301A		27014	LM301A
AR4	230054	IC			LM301A		27014	LM301A
AR5	230411	IC	OP AMP		LM201A-H		27014	LM201A-H
CR1	210004	DIODE	SILICO		1N4004		81349	1N4004
CR2	210004	DIODE	SILICO		1N4004		81349	1N4004
CR3	220026	DIODE	ZENER	12 V	1N963B		81349	1N963B
CR4	220026	DIODE	ZENER	12 V	1N963B		81349	1N963B
CR5	220035	DIODE	ZENER	16 V	1N966B	5%	81349	1N966B
CR6	211083	DIODE	SILICO		1N916B		81349	1N916B
CR7	220015	DIODE	SILICO, ZENER		1N967B		81349	1N967B
CR8	220027	DIODE	SILICO ZENER	4.3 V	1N749A		81349	1N749A
CR9	220027	DIODE	SILICO ZENER	4.3 V			81349	1N749A
K1	310134	RELAY, MAGNETIC REED			2 Form A		15636	R6278-3
Q1	200200	TRANS		NPN	200200		21793	200200

401605 – Assy., PCB, ISOLATOR continued

REF DES	RACAL-DANA P/N	DESCRIPTION	FSC	MANU P/N
Q2	200247	TRANS FET DUAL	21793	200247
Q3	200088	TRANS SILICO PNP 2N4248	80131	2N4248
Q5	200161	TRANS DUAL FET E-415	17856	E-415
Q6	200245	TRANS PNP MPS-A92	04713	MPS-A92
Q7	200233	TRANS SILICO NPN MPS-A42	04713	MPS-A42
Q8	200200	TRANS NPN 200200	21793	200200
Q9	200200	TRANS NPN 200200	21793	200200
R1	000103	RES CARBON 10 K 5% 1/4W	81349	RC07GF103J
R2	000513	RES CARBON 51 K 5% 1/4W	81349	RC07GF513J
R3	000513	RES CARBON 51 K 5% 1/4W	81349	RC07GF513J
R4	012098	RES METAL, PRECISION 25.5 K .1% .05W	14298	UAR-1/10 C-6
R6	010529	RES METAL 10 K 1% 1/10W	81349	RN55C1002F
R7	010536	RES METAL 100 K 1% 1/10W	81349	RN55C1003F
R9	001737	RES CARBON FSV 5% 1/4W	21793	001737
R10	001737	RES CARBON FSV 5% 1/4W	21793	001737
R11	000103	RES CARBON 10 K 5% 1/4W	81349	RC07GF103J
R12	012098	RES METAL, PRECISION 25.5 K .1% .05W	81349	UAR-1/10C-6
R13	010106	RES METAL 324 K T-0 1% 1/8W	81349	RN60D3243F
R16	010106	RES METAL 324 K T-0 1% 1/8W	81349	RN60D3243F
R18	000151	RES CARBON 150 OHM 5% 1/4W	81349	RC07GF151J
R19	000151	RES CARBON 150 OHM 5% 1/4W	81349	RC07GF151J
R20	010536	RES METAL 100 K 1% 1/10W	81349	RN55C1003F
R21	010621	RES METAL 49.9 K 1% 1/10W	81349	RN55C4992F
R22	000103	RES CARBON 10 K 5% 1/4W	81349	RC07GF103J
R23	000103	RES CARBON 10 K 5% 1/4W	81349	RC07GF103J
R24	000103	RES CARBON 10 K 5% 1/4W	81349	RC07GF103J
R25	000103	RES CARBON 10 K 5% 1/4W	81349	RC07GF103J
R26	000103	RES CARBON 10 K 5% 1/4W	81349	RC07GF103J
R27	010529	RES METAL 10 K 1% 1/10W	81349	RN55C1002F
R28	000103	RES CARBON 10 K 5% 1/4W	81349	RC07GF103J
R32	000200	RES CARBON 20 OHM 5% 1/4W	81349	RC07GF200J
R33	010534	RES METAL 34 K 1% 1/10W	81349	RN55C3402F
R34	040232	POT CERMET 10 K 10%	73138	89PR10K
R35	001737	RES CARBON FSV 5% 1/4W	21793	001737
R36	001737	RES CARBON FSV 5% 1/4W	21793	001737
TP1	600786	POST, MACHINE APPLIED STRIP	00779	1-87022-0
TP2	600786	POST, MACHINE APPLIED STRIP	00779	1-87022-0
TP3	600786	POST, MACHINE APPLIED STRIP	00779	1-87022-0
TP4	600786	POST, MACHINE APPLIED STRIP	00779	1-87022-0

401610 – Assy., PCB, SWITCHING

REF DES	RACAL-DANA P/N	DESCRIPTION					FSC	MANU P/N
C1	120309	CAP	POLY	.015 MFD	200 V	5%	27556	PA2C153J
C2	120313	CAP	POLY	.15 MFD	200 V	5%	27556	PA2C154J
CR1	211083	DIODE	SILICO		1N916B		81349	1N916B
CR2	211083	DIODE	SILICO		1N916B		81349	1N916B
CR3	211083	DIODE	SILICO		1N916B		81349	1N916B
CR4	211083	DIODE	SILICO		1N916B		81349	1N916B
K1	310113	RELAY	REED		26 V		15636	R4092-3
K2	310112	RELAY			28 V		26806	AZ421-467-204
K3	310112	RELAY			28 V		26806	AZ421-467-204
K4	310112	RELAY			28 V		26806	AZ421-467-204
K5	310112	RELAY			28 V		26806	AZ421-467-204
K6	310112	RELAY			28 V		26806	AZ421-467-204
R1	001806	RES	CARBON	200 K		5% 2W	01121	See Description
R2	001806	RES	CARBON	200 K		5% 2W	01121	See Description
R4	010033	RES	METAL	49.9 K	T-0	1% 1/8W	81349	RN60D4992F

401603, 404171 – Assy., PCB, COMPUTER I

REF DES	RACAL-DANA P/N	DESCRIPTION					FSC	MANU P/N
C1	110126	CAP	TANTA	6.8 MFD	35 V	20%	05397	T368B685M035AS
C2	110126	CAP	TANTA	6.8 MFD	35 V	20%	05397	T368B685M035AS
C3	100017	CAP	CERMET	.01 MFD	100 V	20%	56289	C023B101F103M
C4	100017	CAP	CERMET	.01 MFD	100 V	20%	56289	C023B101F103M
C5	110126	CAP	TANTA	6.8 MFD	35 V	20%	05397	T368B685M035AS
C6	100017	CAP	CERMET	.01 MFD	100 V	20%	56289	C023B101F103M
C7	100017	CAP	CERMET	.01 MFD	100 V	20%	56289	C023B101F103M
R1	000473	RES	CARBON	47 K		5% 1/4W	81349	RC07GF473J
U1	230402	IC			74LS30N		27014	74LS30N
U2	230193	IC			SN74LS00N		01295	SN74LS00N
U3	230368	IC			74LS138		27014	74LS138
U4	230305	IC			SN74LS08		01295	SN74LS08
U5	230330	IC			74LS367		01295	74LS367
U6	230330	IC			74LS367		01295	74LS367
U7	230330	IC			74LS367		01295	74LS367
U8	230330	IC			74LS367		01295	74LS367
U9	230368	IC			74LS138		27014	74LS138
U10	230368	IC			74LS138		27014	74LS138
U11	230520	IC - Memory - U11					21793	230520
U12	230369	IC			6802-P		04713	6802-P
U13	230375	IC			AM9112APC			AM9112APC
U14	230375	IC			AM9112APC			AM9112APC
U15	230375	IC			AM9112APC			AM9112APC
U16	230375	IC			AM9112APC			AM9112APC
U17*	230523	IC - Memory - U17					21793	230523
U18	230400	IC	ROM	"U14"	S6831-U14		31471	S6831-U14
U19	230548	IC	ROM		2K x 8 – U19		21793	230548
U20	230522	IC - Memory - U20					21793	230522
U21	230521	IC - Memory - U21					21793	230521

*Used only in 404171

401604 – Assy., PCB, CONTROL LOGIC

REF DES	RACAL-DANA P/N	DESCRIPTION					FSC	MANU P/N
C1	110137	CAP	TANTA	.47 MFD	35 V	20%	05397	T368A474M035AS
C2	110137	CAP	TANTA	.47 MFD	35 V	20%	05397	T368A474M035AS
C3	100017	CAP	CERAM	.01 MFD	100 V	20%	56289	C023B101F103M
C4	100017	CAP	CERAM	.01 MFD	100 V	20%	56289	C023B101F103M
C5	110126	CAP	TANTA	6.8 MFD	35 V	20%	05397	T368B685M035AS
C6	100017	CAP	CERAM	.01 MFD	100 V	20%	56289	C023B101F103M
C7	120003	CAP	MYLAR	.1 MFD	100 V		09023	WMF1P1
C8	100017	CAP	CERAM	.01 MFD	100 V	20%	56289	C023B101F103M
C9	100017	CAP	CERAM	.01 MFD	100 V	20%	56289	C023B101F103M
C10	130144	CAP	MICA	270 PFD	100 V	5%	72136	DM10271J
C11	130162	CAP	MICA	33 PFD	500 V	5%	09023	CD6ED330J03
C12	100017	CAP	CERAM	.01 MFD	100 V	20%	56289	C023B101F103M
C13	100017	CAP	CERAM	.01 MFD	100 V	20%	56289	C023B101F103M
C14	100017	CAP	CERAM	.01 MFD	100 V	20%	56289	C023B101F103M
C15	100071	CAP	CERAM	.001 MFD	1000 V	20%	56289	C023B102E102M
C16	100068	CAP	CERAM	.02 MFD	100 V	20%	56289	C023B101H203M
CR1	211083	DIODE	SILICO		1N916B		81349	1N916B
Q1	200037	TRANS	SILICO	NPN	2N3646		80131	2N3646
Q2	200099	TRANS		PNP	2N4258		81349	2N4258
Q3	200037	TRANS	SILICO	NPN	2N3646		80131	2N3646
Q4	200099	TRANS		PNP	2N4258		81349	2N4258
Q5	230037	TRANS	SILICO	NPN	2N3646		80131	2N3646
Q6	200261	TRANS	SILICO	NPN	2N2369		81349	2N2369
Q7	230037	TRANS	SILICO	NPN	2N3646		80131	2N3646
Q8	230037	TRANS	SILICO	NPN	2N3646		80131	2N3646
Q9	200095	TRANS		NPN	2N3563		81349	2N3563
R1	000200	RES	CARBON	20 OHM		5% 1/4W	81349	RC07GF200J
R2	000200	RES	CARBON	20 OHM		5% 1/4W	81349	RC07GF200J
R3	000362	RES	CARBON	3.6 K		5% 1/4W	81349	RC07GF362J
R4	000562	RES	CARBON	5.6 K		5% 1/4W	81349	RC07GF562J
R5	000362	RES	CARBON	3.6 K		5% 1/4W	81349	RC07GF362J
R6	000682	RES	CARBON	6.8 K		5% 1/4W	81349	RC07GF682J
R7	000362	RES	CARBON	3.6 K		5% 1/4W	81349	RC07GF362J
R8	000562	RES	CARBON	5.6 K		5% 1/4W	81349	RC07GF562J
R9	000201	RES	CARBON	200 OHM		5% 1/4W	81349	RC07GF201J
R10	000201	RES	CARBON	200 OHM		5% 1/4W	81349	RC07GF201J
R11	000361	RES	CARBON	360 OHM		5% 1/4W	81349	RC07GF361J
R12	000103	RES	CARBON	10 K		5% 1/4W	81349	RC07GF103J
R13	010828	RES	METAL	45.3 K		1% 1/10W	81349	RN55C4532F
R14	010618	RES	METAL	200 K		.25% 1/10W	81349	RN55C2003C
R15	000135	RES	CARBON	1.3 M		5% 1/4W	81349	RC07GF135J

401604 – Assy., PCB, CONTROL LOGIC continued

REF DES	RACAL-DANA P/N	DESCRIPTION	FSC	MANU P/N
R16	000205	RES CARBON 2 M 5% 1/4W	81349	RC07GF205J
R17	000102	RES CARBON 1 K 5% 1/4W	81349	RC07GF102J
R18	000102	RES CARBON 1 K 5% 1/4W	81349	RC07GF102J
R19	000151	RES CARBON 150 OHM 5% 1/4W	81349	RC07GF151J
R20	000682	RES CARBON 6.8 K 5% 1/4W	81349	RC07GF682J
R21	000562	RES CARBON 5.6 K 5% 1/4W	81349	RC07GF562J
R22	000331	RES CARBON 330 OHM 5% 1/4W	81349	RC07GF331J
TP1	600786	POST, MACHINE APPLIED STRIP	00779	1-87022-0
U1	230330	IC 74LS367	01295	74LS367
U2	230330	IC 74LS367	01295	74LS367
U3	230330	IC 74LS367	01295	74LS367
U4	230330	IC 74LS367	01295	74LS367
U5	230330	IC 74LS367	01295	74LS367
U6	230380	IC 74LS03	01295	74LS03
U7	230194	IC SN74LS74N	01295	SN74LS74N
U8	230193	IC SN74LS00N	01295	SN74LS00N
U9	230193	IC SN74LS00N	01295	SN74LS00N
U10	230368	IC 74LS138	27014	74LS138
U11	230363	IC LM555CN	27014	LM555CN
U12	230317	IC SN74LS90	01295	SN74LS90
U13	230317	IC SN74LS90	01295	SN74LS90
U14	230317	IC SN74LS90	01295	SN74LS90
U15	230383	IC 74LS490AN	01295	74LS490AN
U16	230383	IC 74LS490AN	01295	74LS490AN
U17	230194	IC SN74LS74N	01295	SN74LS74N
U18	230193	IC SN74LS00N	01295	SN74LS00N
U19	230193	IC SN74LS00N	01295	SN74LS00N
U20	230194	IC SN74LS74N	01295	SN74LS74N
U21	230194	IC SN74LS74N	01295	SN74LS74N
U22	230380	IC 74LS03	01295	74LS03
U23	230510	IC 74LS164		74LS164
U24	230313	IC CD4016AE	86884	CD4016AE
Y1	920811	CRYSTAL, SOLDER SEAL 24 MHz	27193	920811
Z1	080005	RES CERMET 10 K Network 6P,5R 2%	11236	750-61-R10KΩ

404019 – Assy., PARALLEL BCD OPTION

REF DES	RACAL-DANA P/N	DESCRIPTION	FSC	MANU P/N
U17	230407	IC ROM	31471	S6831B

401624 -- Assy., PCB, PARALLEL BCD

REF DES	RACAL-DANA P/N	DESCRIPTION	FSC	MANU P/N
C1	100080	CAP CERAM .05 MFD 100 V 20%	56289	C023A101L503M
C2	100017	CAP CERAM .01 MFD 100 V 20%	56289	C023B101F103M
C3	110126	CAP TANTA 6.8 MFD 35 V 20%	05397	T368B685M035AS
C4	100017	CAP CERAM .01 MFD 100 V 20%	56289	C023B101F103M
C5	100080	CAP CERAM .05 MFD 100 V 20%	56289	C023A101L503M
C6	100080	CAP CERAM .05 MFD 100 V 20%	56289	C023A101L503M
C7	100017	CAP CERAM .01 MFD 100 V 20%	56289	C023B101F103M
C8	100017	CAP CERAM .01 MFD 100 V 20%	56289	C023B101F103M
C9	110153	CAP TANTA .27 MFD 50 V 10%	05397	KR27P50K
C10	100017	CAP CERAM .01 MFD 100 V 20%	56289	C023B101F103M
C11	100017	CAP CERAM .01 MFD 100 V 20%	56289	C023B101F103M
C12	121091	CAP MYLAR .033 MFD 100 V 10%	09023	WMF1S33
C13	110165	CAP TANTA .15 MFD 35 V 10%	05397	T368A154K035AS
C14	110152	CAP TANTA .47 MFD 50 V 10%	05397	T368A474K050AS
C15	100017	CAP CERMET .01 MFD 100 V 20%	56289	C023B101F103M
P12	600930	CABLE ASSY 50 P	21793	600930
R1	000512	RES CARBON 5.1 K 5% 1/4W	81349	RC07GF512J
R2	000512	RES CARBON 5.1 K 5% 1/4W	81349	RC07GF512J
R3	000512	RES CARBON 5.1 K 5% 1/4W	81349	RC07GF512J
R4	000512	RES CARBON 5.1 K 5% 1/4W	81349	RC07GF512J
R5	000512	RES CARBON 5.1 K 5% 1/4W	81349	RC07GF512J
R6	010609	RES METAL 909 K 1% 1/8W	81349	RN60D9093F
U1	230366	INTEGRATED CIRCUIT DM74LS174N	27014	DM74LS174N
U2	230366	INTEGRATED CIRCUIT DM74LS174N	27014	DM74LS174N
U3	230356	INTEGRATED CIRCUIT 74LS175	27014	74LS175
U4	230368	INTEGRATED CIRCUIT 74LS138	27014	74LS138
U5	230194	INTEGRATED CIRCUIT SN74LS74N	01295	SN74LS74N
U7	230193	INTEGRATED CIRCUIT SN74LS00N	01295	SN74LS00N
U8	230064	INTEGRATED CIRCUIT 7404	01295	7404
U9	230193	INTEGRATED CIRCUIT SN74LS00N	01295	SN74LS00N
U10	230366	INTEGRATED CIRCUIT DM74LS174N	27014	DM74LS174N
U11	230366	INTEGRATED CIRCUIT DM74LS174N	27014	DM74LS174N
U12	230366	INTEGRATED CIRCUIT DM74LS174N	27014	DM74LS174N
U13	230368	INTEGRATED CIRCUIT 74LS138	27014	74LS138
U14	230330	INTEGRATED CIRCUIT 74LS367	01295	74LS367
U15	230330	INTEGRATED CIRCUIT 74LS367	01295	74LS367
U16	230330	INTEGRATED CIRCUIT 74LS367	01295	74LS367
U17	230354	INTEGRATED CIRCUIT 74LS75	18324	74LS75

401624 – Assy., PCB, PARALLEL BCD *(continued)*

REF DES	RACAL-DANA P/N	DESCRIPTION	FSC	MANU P/N
U18	230354	INTEGRATED CIRCUIT 74LS75	18324	74LS75
U19	230354	INTEGRATED CIRCUIT 74LS75	18324	74LS75
U20	230193	INTEGRATED CIRCUIT SN74LS00N	01295	SN74LS00N
U21	230064	INTEGRATED CIRCUIT 7404	01295	7404
U22	230248	INTEGRATED CIRCUIT SN74LS10N	01295	SN74LS10N
U23	230313	INTEGRATED CIRCUIT CD4016AE	86884	CD4016AE
U24	230194	INTEGRATED CIRCUIT SN74LS74N	01295	SN74LS74N
U25	230363	INTEGRATED CIRCUIT LM555CN	27014	LM555CN
Z1	080004	RES CERMET 4.7 K NETWORK 6P,5R 2%	11236	750-61-R4.7KΩ
Z2	080004	RES CERMET 4.7 K NETWORK 6P,5R 2%	11236	750-61-R4.7KΩ
Z3	080004	RES CERMET 4.7 K NETWORK 6P,5R 2%	11236	750-61-R4.7KΩ
Z4	080023	RES CERMET 4.7 K NETWORK 8P,7R 2%	11236	750-81-R4.7KΩ
Z5	080004	RES CERMET 4.7 K NETWORK 6P,5R 2%	11236	750-61-R4.7KΩ

404020 – Assy., CABLE, PARALLEL BCD, 25 PIN

REF DES	RACAL-DANA P/N	DESCRIPTION	FSC	MANU P/N
J209	600167	CONN 25 S	71785	DB-25S

401612 – Assy., PCB, OHMS

REF DES	RACAL-DANA P/N	DESCRIPTION	FSC	MANU P/N
AR1	230054	IC	27014	LM301A
AR2	230415	IC HIGH VOLTAGE OP AMP	27014	LM343H
C1	101175	CAP CERAM 220 PFD 500 V 10%	71471	SCD1X5F
C2	101175	CAP CERAM 220 PFD 500 V 10%	71471	SCD1X5F
C3	100012	CAP CERAM 33 PFD 500 V 10%	71471	TCD-DI-1(N750)
C4	101174	CAP CERAM .001 MFD 500 V 10%	04222	SCD-DI-2X5F-1000
C5	100017	CAP CERAM .01 MFD 100 V 20%	56289	C023B101F103M
C6	101174	CAP CERAM .001 MFD 500 V 10%	04222	SCD-DI-2X5F-1000
C7	100017	CAP CERAM .01 MFD 100 V 20%	56289	C023B101F103M
C8	101145	CAP CERAM 100 PFD 500 V 10%	04222	TCD-DI-1N5600-100
C9	101174	CAP CERAM .001 MFD 500 V 10%	04222	SCD-DI-2X5F-1000
C10	120290	CAP MYLAR .22 MFD 100 V 20%	73445	C281AH/A220K
C11	120036	CAP POLY 3300 PFD 630 V 5%	08257	CPR-330J
CR1	211083	DIODE SILICO 1N916B	81349	1N916B
CR2	211083	DIODE SILICO 1N916B	81349	1N916B
CR3	211083	DIODE SILICO 1N916B	81349	1N916B
CR4	211083	DIODE SILICO 1N916B	81349	1N916B
CR5	210014	DIODE 1N4005	81349	1N4005
CR6	211083	DIODE SILICO 1N916B	81349	1N916B
CR7	211083	DIODE SILICO 1N916B	81349	1N916B
CR8	220015	DIODE SILICO, ZENER 1N967B	81349	1N967B
K1	310136	RELAY, MAGNETIC REED 1 Form A	15636	R6277-3
K2	310134	RELAY, MAGNETIC REED 2 Form A	15636	R6278-3
K3	310134	RELAY, MAGNETIC REED 2 Form A	15636	R6278-3
K4	310112	RELAY 28 V AZ421-467-204	26806	AZ421-467-204
K5	310112	RELAY 28 V AZ421-467-204	26806	AZ421-467-204
Q1	200201	TRANS Dual NPN 200201	21793	200201
Q2	200200	TRANS NPN 200200	21793	200200
Q3	200200	TRANS NPN 200200	21793	200200
Q4	200088	TRANS SILICO PNP 2N4248	80131	2N4248
Q5	200068	TRANS PNP 2N4250	80131	2N4250
Q6	200068	TRANS PNP 2N4250	80131	2N4250
Q7	200068	TRANS PNP 2N4250	80131	2N4250
Q8	200200	TRANS NPN 200200	21793	200200
Q9	200200	TRANS NPN 200200	21793	200200
Q10	200245	TRANS PNP MPS-A92	04713	MPS-A92
Q11	200245	TRANS PNP MPS-A92	04713	MPS-A92

401612 – Assy., PCB, OHMS continued

REF DES	RACAL-DANA P/N	DESCRIPTION					FSC	MANU P/N
Q12	200200	TRANS		NPN	200200		21793	200200
Q13	200200	TRANS		NPN	200200		21793	200200
Q14	200247	TRANS		DUAL J-FET	5μV/°C		21793	200247
Q15	200088	TRANS	SILICO	PNP	2N4248		80131	2N4248
Q16	200200	TRANS		NPN	200200		21793	200200
Q17	200245	TRANS		PNP	MPS-A92		04713	MPS-A92
Q18	200245	TRANS		PNP	MPS-A92		04713	MPS-A92
Q19	200200	TRANS		NPN	200200		21793	200200
Q20	200088	TRANS	SILICO	PNP	2N4248		80131	2N4248
R1	010780	RES	METAL	499 K		1% 1/8W	81349	RN60E4993F
R2	010780	RES	METAL	499 K		1% 1/8W	81349	RN60E4993F
R3	000203	RES	CARBON	20 K		5% 1/4W	81349	RC07GF203J
R4	010784	RES	CARBON	4.7 M		1%	91637	DC1-4
R5	000202	RES	CARBON	2 K		5% 1/4W	81349	RC07GF202J
R6	001816	RES	CARBON	47 K		5% 2W	01121	See Description
R7	001816	RES	CARBON	47 K		5% 2W	01121	See Description
R10	010118	RES	METAL	56.2 K	T-0	1% 1/8W	81349	RN60D5622F
R11	000203	RES	CARBON	20 K		5% 1/4W	81349	RC07GF203J
R12	000205	RES	CARBON	2 M		5% 1/4W	81349	RC07GF205J
R13	000205	RES	CARBON	2 M		5% 1/4W	81349	RC07GF205J
R14	000205	RES	CARBON	2 M		5% 1/4W	81349	RC07GF205J
R15	000205	RES	CARBON	2 M		5% 1/4W	81349	RC07GF205J
R16	040229	POT	CERMET	1 K		10% 3/4W	73138	89PR1K
R17	000473	RES	CARBON	47 K		5% 1/4W	81349	RC07GF473J
R18	000221	RES	CARBON	220 OHM		5% 1/4W	81349	RC07GF221J
R19	000221	RES	CARBON	220 OHM		5% 1/4W	81349	RC07GF221J
R20	000104	RES	CARBON	100 K		5% 1/4W	81349	RC07GF104J
R21	000104	RES	CARBON	100 K		5% 1/4W	81349	RC07GF104J
R22	000753	RES	CARBON	75 K		5% 1/4W	81349	RC07GF753J
R23	010118	RES	METAL	56.2 K	T-0	1% 1/8W	81349	RN60D5622F
R24	000112	RES	CARBON	1.1 K		5% 1/4W	81349	RC07GF112J
R25	000393	RES	CARBON	39 K		5% 1/4W	81349	RC07GF393J
R26	000103	RES	CARBON	10 K		5% 1/4W	81349	RC07GF103J
R27	000102	RES	CARBON	1 K		5% 1/4W	81349	RC07GF102J
R28	001816	RES	CARBON	47 K		5% 2W	01121	See Description
R29	010337	RES	CARBON	10 M		1% 1/2W	81349	RN20X1005F
W1	600245	JUMPER	INSULATED					L-2007-1LP
W2	600245	JUMPER	INSULATED					L-2007-1LP
W3	600245	JUMPER	INSULATED					L-2007-1LP

401607 – Assy., PCB, OHMS REFERENCE

REF DES	RACAL-DANA P/N	DESCRIPTION					FSC	MANU P/N
AR1	230054	IC			LM301A		27014	LM301A
C1	100012	CAP	CERAM	33 PFD	500 V	10%	71471	TCD-DI-1(N750)
K1	310134	RELAY	MAGNETIC REED		2 Form A		15636	R6278-3
R1	010656	RES	METAL	19.948 M		.1% 1/2W	81349	RN70E Type
R2	020716	RES	WW	10 K		.1% .05W	22045	J90
R3	010719	RES	METAL	16.2 K		1% 1/10W	81349	RN55C1622F
R4	020719	RES	WW	20 K		.1% .05W	22045	J90
R5	020716	RES	W	10 K		.1% .05W	22045	J90
R6	010655	RES	METAL	11.086 M		.1% 1/2W	81349	RN70E Type
R7	000470	RES	CARBON	47 OHM		5% 1/4W	81349	RC07GF470J
R8	020712	RES	WW	112.5 K		.01% .15W	22045	J110
R9	020699	RES	WW	4.0004 K		.01% .15W	22045	J110
R10	020612	RES	WW	1.009 M		.05% 1/4W	22045	J120
R11	020698	RES	WW	445.71 OHM		.05% .15W	22045	J110
R12	001759	RES	CARBON	5.1 OHM		5% 1/4W	81349	RC07GF5R1J
R13	020718	RES	WW	2 K		.1% .05W	22045	J90
R15	012038	RES	METAL	10 K		.1% .3W	18612	HP-202
R16	020707	RES	WW	5 K		.02% .15W	22045	J110
R17	020708	RES	WW	20 K		.05% .15W	22045	J110
W1	600245	JUMPER	INSULATED					L-2007-1LP

401619 – Assy., PCB, AVERAGING AC CONVERTER

REF DES	RACAL-DANA P/N	DESCRIPTION					FSC	MANU P/N
AR1	230103	IC			LM308		27014	LM308
AR2	230103	IC			LM308		27014	LM308
AR3	230054	IC			LM301A		27014	LM301A
B1	920563	BEADS	SHIELDING				02114	56-59065/4B
B2	920563	BEADS	SHIELDING				02114	56-59065/4B
C1	100017	CAP	CERAM	.01 MFD	100 V	20%	56289	C023B101F103M
C2	100017	CAP	CERAM	.01 MFD	100 V	20%	56289	C023B101F103M
C3	110126	CAP	TANTA	6.8 MFD	35 V	20%	05397	T368B685M035AS
C4	100081	CAP	CERAM	4.7 PFD	1000 V	5%	56289	C030B102E4R7D
C5	121394	CAP	MYLAR	.15 MFD	100 V	10%	09023	WMF1P15
C6	121394	CAP	MYLAR	.15 MFD	100 V	10%	09023	WMF1P15
C7	100017	CAP	CERAM	.01 MFD	100 V	20%	56289	C023B101F103M
C8	100095	CAP	CERAM	2.7 ± .5 PFD	1000 V		56289	C030B102S2R7D
C9	120130	CAP	MYLAR	.15 MFD	100 V	5%	27556	XT2B154J
C10	120025	CAP	MYLAR	1.5 MFD	100 V	10%	27556	XA2B155K
C11	110126	CAP	TANTA	6.8 MFD	35 V	20%	05397	T368B685M035AS
C12	100017	CAP	CERAM	.01 MFD	100 V	20%	56289	C023B101F103M
C13	130131	CAP	TRIMMER	2-20 PFD	100 V		73445	C010KA/20E
C14	100017	CAP	CERAM	.01 MFD	100 V	20%	56289	C023B101F103M
C15	100095	CAP	CERAM	2.7 ± .5 PFD	1000 V		56289	C030B102S2R7D
C16	100017	CAP	CERAM	.01 MFD	100 V	20%	56289	C023B101F103M
C17	110126	CAP	TANTA	6.8 MFD	35 V	20%	05397	T368B685M035AS
C18	100017	CAP	CERAM	.01 MFD	100 V	20%	56289	C023B101F103M
C19	100012	CAP	CERAM	33 PFD	500 V	10%	71471	TCD-DI-1(N750)
C20	100017	CAP	CERAM	.01 MFD	100 V	20%	56289	C023B101F103M
C21	100012	CAP	CERAM	33 PFD	500 V	10%	71471	TCD-DI-1(N750)
C22	100017	CAP	CERAM	.01 MFD	100 V	20%	56289	C023B101F103M
C23	100012	CAP	CERAM	33 PFD	500 V	10%	71471	TCD-DI-1(N750)
C24	100017	CAP	CERAM	.01 MFD	100 V	20%	56289	C023B101F103M
C25	100017	CAP	CERAM	.01 MFD	100 V	20%	56289	C023B101F103M
C26	100038	CAP	CERAM	560 PFD	500 V	10%	71590	DD561
C27	110126	CAP	TANTA	6.8 MFD	35 V	20%	05397	T368B685M035AS
C28	110125	CAP	TANTA	2.2 MFD	35 V	20%	05397	T368B225M035AS
C29	100038	CAP	CERAM	560 PFD	500 V	10%	71590	DD561
C30	110181	CAP	TANTA	47 MFD	25 V		05397	T36D476025A
C31	110181	CAP	TANTA	47 MFD	25 V		05397	T36D476025A
CR1	220004	DIODE	SILICO, ZENER		1N961B		81349	1N961B
CR2	210035	DIODE	HOT CARRIER		HP5082-2810		50434	HP5082-2810
CR3	210035	DIODE	HOT CARRIER		HP5082-2810		50434	HP5082-2810

401619 – Assy., PCB, AVERAGING AC CONVERTER continued

REF DES	RACAL-DANA P/N	DESCRIPTION					FSC	MANU P/N
CR4	220004	DIODE	SILICO, ZENER		1N961B		81349	1N961B
CR5	220035	DIODE	ZENER		16V	5%	81349	1N966B
CR6	220035	DIODE	ZENER		16V	5%	81349	1N966B
Q1	200197	TRANS	SILICO	NPN	MPS-H10		04713	MPS-H10
Q2	200197	TRANS	SILICO	NPN	MPS-H10		04713	MPS-H10
Q3	200178	TRANS		PNP	2N5910		81349	2N5910
Q4	200197	TRANS	SILICO	NPN	MPS-H10		04713	MPS-H10
Q5	200197	TRANS	SILICO	NPN	MPS-H10		04713	MPS-H10
Q6	200197	TRANS	SILICO	NPN	MPS-H10		04713	MPS-H10
Q7	200200	TRANS		NPN	200200		21793	200200
Q8	200201	TRANS	DUAL	NPN	200201		21793	200201
Q9	200201	TRANS	DUAL	NPN	200201		21793	200201
Q10	200200	TRANS		NPN	200200		21793	200200
Q11	200200	TRANS		NPN	200200		21793	200200
Q12	200200	TRANS		NPN	200200		21793	200200
Q13	200068	TRANS		PNP	2N4250		80131	2N4250
Q14	200179	TRANS		FET	KE4391		27014	KE4391
Q15	200178	TRANS		PNP	2N5910		81349	2N5910
R1	000333	RES	CARBON	33 K		5% 1/4W	81349	RC07GF333J
R2	000201	RES	CARBON	200 OHM		5% 1/4W	81349	RC07GF201J
R3	000510	RES	CARBON	51 OHM		5% 1/4W	81349	RC07GF510J
R4	000512	RES	CARBON	5.1 K		5% 1/4W	81349	RC07GF512J
R5	000751	RES	CARBON	750 OHM		5% 1/4W	81349	RC07GF751J
R6	000163	RES	CARBON	16 K		5% 1/4W	81349	RC07GF163J
R7	000113	RES	CARBON	11 K		5% 1/5W	81349	RC07GF113J
R8	000562	RES	CARBON	5.6 K		5% 1/4W	81349	RC07GF562J
R9	000100	RES	CARBON	10 OHM		5% 1/4W	81349	RC07GF100J
R10	000105	RES	CARBON	1 M		5% 1/4W	81349	RC07GF105J
R11	000161	RES	CARBON	160 OHM		5% 1/4W	81349	RC07GF161J
R12	000333	RES	CARBON	33 K		5% 1/4W	81349	RC07GF333J
R13	000183	RES	CARBON	18 K		5% 1/4W	81349	RC07GF183J
R14	000103	RES	CARBON	10 K		5% 1/4W	81349	RC07GF103J
R15	010529	RES	METAL	10 K		1% 1/10W	81349	RN55C1002F
R16	000107	RES	CARBON	100 M		5% 1/4W	81349	RC07GF107J
R17	000911	RES	CARBON	910 OHM		5% 1/4W	81349	RC07GF911J
R18	000101	RES	CARBON	100 OHM		5% 1/4W	81349	RC07GF101J
R19	000153	RES	CARBON	15 K		5% 1/4W	81349	RC07GF153J
R20	000101	RES	CARBON	100 OHM		5% 1/4W	81349	RC07GF101J

401619 – Assy., PCB, AVERAGING AC CONVERTER continued

REF DES	RACAL-DANA P/N	DESCRIPTION				FSC	MANU P/N
R21	010727	RES	METAL	2.5 K	.01%	18612	V53-1M
R22	000332	RES	CARBON	3.3 K	5% 1/4W	81349	RC07GF332J
R23	000103	RES	CARBON	10 K	5% 1/4W	81349	RC07GF103J
R24	020657	RES	WW	11.109 K	.01% .15W	22045	J110
R25	010536	RES	METAL	100 K	1% 1/10W	81349	RN55C1003F
R26	010631	RES	METAL	10.2 K	1% 1/10W	81349	RN55C1022F
R27	000124	RES	CARBON	120 K	5% 1/4W	81349	RC07GF124J
R28	000106	RES	CARBON	10 M	5% 1/4W	81349	RC07GF106J
R29	010808	RES	METAL	10 K	.1% 1/10W	81349	RN55C1002B
R30	000201	RES	CARBON	200 OHM	5% 1/4W	81349	RC07GF201J
R31	000101	RES	CARBON	100 OHM	5% 1/4W	81349	RC07GF101J
R32	000102	RES	CARBON	1 K	5% 1/4W	81349	RC07GF102J
R33	010660	RES	METAL	5 K	.01%	18612	V53-1
R34	000151	RES	CARBON	150 OHM	5% 1/4W	81349	RC07GF151J
R35	000821	RES	CARBON	820 OHM	5% 1/4W	81349	RC07GF821J
R36	000101	RES	CARBON	100 OHM	5% 1/4W	81349	RC07GF101J
R37	010661	RES	METAL	10 K	.01%	18612	V53-1M
R38	010529	RES	METAL	10 K	1% 1/10W	81349	RN55C1002F
R39	010829	RES	METAL	4.99 K	1% 1/10W	81349	RN55C4991F
R40	040234	POT	CERMET	50 K	10%	73138	89PR50K
R41	010650	RES	METAL	1 M	1% 1/10W	81349	RN55E1004F
R42	000103	RES	CARBON	10 K	5% 1/4W	81349	RC07GF103J
R43	010650	RES	METAL	1 M	1% 1/10W	81349	RN55E1004F
R44	010650	RES	METAL	1 M	1% 1/10W	81349	RN55E1004F
R45	010650	RES	METAL	1 M	1% 1/10W	81349	RN55E1004F
R46	040234	POT	CERMET	50 K	10%	73138	89PR50K
R47	000105	RES	CARBON	1 M	5% 1/4W	81349	RC07GF105J
R48	001159	RES	CARBON	330 OHM	5% 1/2W	81349	RC07GF331J
R49	001159	RES	CARBON	330 OHM	5% 1/2W	81349	RC07GF331J
R50	040235	POT	CERMET	100 K	10% 3/4W	73138	89PR100K
TP1	600591	POST	TEST POINT			00779	85931-6
TP2	600591	POST	TEST POINT			00779	85931-6
TP3	600591	POST	TEST POINT			00779	85931-6
TP4	600591	POST	TEST POINT			00779	85931-6
TP5	600591	POST	TEST POINT			00779	85931-6
TP6	600591	POST	TEST POINT			00779	85931-6
TP7	600591	POST	TEST POINT			00779	85931-6

401626 – Assy., PCB, 4-WIRE RATIO

REF DES	RACAL-DANA P/N	DESCRIPTION						FSC	MANU P/N
AR1	230103	INTEGRATED CIRCUIT			LM308			27014	LM308
AR2	230103	INTEGRATED CIRCUIT			LM308			27014	LM308
AR3	230127	INTEGRATED CIRCUIT			SSS725C			06665	SSS725C
C1	110126	CAP	TANTA	6.8 MFD	35 V	20%		05397	T363B685M035AS
C2	100017	CAP	CERAM	.01 MFD	100 V	20%		56289	C023B101F103M
C3	100017	CAP	CERAM	.01 MFD	100 V	20%		56289	C023B101F103M
C4	110126	CAP	TANTA	6.8 MFD	35 V	20%		05397	T368B685M035AS
C5	100012	CAP	CERAM	33 PFD	500 V	10%		71471	TOD-DI-1 (N750)
C6	120312	CAP	POLY	.022 MFD	400 V	10%		73445	C280MAF/A22K
C7	120308	CAP	POLY	.047 MFD	250 V	10%		73445	C280MAE/A47K
C8	100012	CAP	CERAM	33 PFD	500 V	10%		71471	TCD-DI-1(N750)
C9	100017	CAP	CERAM	.01 MFD	100 V	20%		56289	C023B101F103M
C10	110158	CAP	TANTA	10 MFD	50 V	10%		05397	T362C106K050A
Q1	200200	TRANS	NPN		200200			21793	200200
Q2	200200	TRANS	NPN		200200			21793	200200
R1	000390	RES	CARBON	39 OHM		5%	1/4W	81349	RC07GF390J
R2	000100	RES	CARBON	10 OHM		5%	1/4W	81349	RC07GF100J
R3	010033	RES	METAL	49.9 K	T-O	1%	1/8W	81349	RN60D4992F
R4	010033	RES	METAL	49.9 K	T-O	1%	1/8W	81349	RN60D4992F
R6	010787	RES	METAL	20 K		.02%		18612	V53-1
R7	010787	RES	METAL	20 K		.02%		18612	V53-1
R8	010033	RES	METAL	49.9 K	T-O	1%	1/8W	81349	RN60D4992F
R9	010787	RES	METAL	20 K		.02%		18612	V53-1
R10	000100	RES	CARBON	10 OHM		5%	1/4W	81349	RC07GF100J
R11	040229	POT	CERAM	1 K		10%	3/4W	73138	89PR1K
R12	040235	POT	CERAM	100 K		10%	3/4W	73138	89PR100K
R13	010033	RES	METAL	49.9 K	T-O	1%	1/8W	81349	RN60D4992F
R14	000100	RES	CARBON	10 OHM		5%	1/4W	81349	RC07GF100J
R15	040229	POT	CERAM	1 K		10%	3/4W	73138	89PR1K
R16	010787	RES	METAL	20 K		.02%		18612	V53-1

401618 – Assy., PCB, RMS CONVERTER

REF DES	RACAL-DANA P/N	DESCRIPTION					FSC	MANU P/N
AR1	230054	IC			LM301A		27014	LM301A
AR2	230180	IC	OP AMP		LM318H		27014	LM318H
B1	920563	BEADS	SHIELDING				02114	56-59065/4B
C1	101174	CAP	CERAM	.001 MFD	500 V	10%	04222	SCD-DI-2X5F-1000
C2	101642	CAP	CERAM	150 PFD	500 V	10%	71471	SCD1X5F
C3	120026	CAP	MYLAR	.47 MFD	100 V	10%	27556	SA2B474K
C4	100100	CAP	CERAM	FSV			21793	100100
C5	130160	CAP	MICA	330 PFD			72136	DM15 Series
C6	110151	CAP	TANTA	10 MFD	35 V	20%	05397	T362C106M035AS
C7	120026	CAP	MYLAR	.47 MFD	100 V	10%	27556	SA2B474K
C8	130076	CAP	MICA	200 PFD	500 V	5%	72136	DM15-201J
C9	100017	CAP	CERAM	.01 MFD	100 V	20%	56289	C023B101F103M
C10	101641	CAP	CERAM	470 PFD	500 V	10%	71471	SCD1X5F
C11	100100	CAP	CERAM	FSV			21793	100100
C12	130095	CAP	MICA	390 PFD	100 V	5%	72136	SCDM10-391J
C13	120280	CAP	MYLAR	.22 MFD	1000 V	10%	27556	ZA2J224K
C15	110151	CAP	TANTA	10 MFD	35 V	20%	05397	T362C106M035AS
C16	100100	CAP	CERAM	FSV			21793	100100
C17	120286	CAP	MYLAR	.1 MFD	100 V	20%	73445	C281AH/A100K
C18	101641	CAP	CERAM	470 MFD	500 V	10%	71471	SCD1X5F
C19	120026	CAP	MYLAR	.47 MFD	100 V	10%	27556	SA2B474K
C20	110126	CAP	TANTA	6.8 MFD	35 V	20%	05397	T368B685M035AS
C21	101641	CAP	CERAM	470 MFD	500 V	10%	71471	SCD1X5F
C22	101098	CAP	CERAM	330 PFD	500 V	10%	56289	10TS-T33
C23	130124	CAP	TRIMMER	1.2-10 PFD	250 V		52763	R-TR1K0-12209SD
C24	130123	CAP	TRIMMER	1-3 PFD	250 V		52763	R-TR1K0-122-09SD
C25	100017	CAP	CERAM	.01 MFD	100 V	20%	56289	C023B101F103M
C26	100050	CAP	CERAM	2.2 PFD	1000 V	5%	56289	C030B102S2R2D
C27	130146	CAP	TRIMMER	.25-1.5 PFD			74970	273-0001-002
C28	130146	CAP	TRIMMER	.25-1.5 PFD			74970	273-0001-002
C29	130116	CAP	MICA	3900 PFD	500 V	2%	72136	DM19F392G0
C30	100052	CAP	CERAM	22 PFD	1000 V	5%	56289	C030B102F220J
C31	100084	CAP	CERAM	1.5 ± .5 PFD	1000 V		56289	C030B102S1R5D
C32	110151	CAP	TANTA	10 MFD	35 V	20%	05397	T362C106M035AS
C33	110151	CAP	TANTA	10 MFD	35 V	20%	05397	T362C106M035AS
C34	100017	CAP	CERAM	.01 MFD	100 V	20%	56289	C023B101F103M
C35	100017	CAP	CERAM	.01 MFD	100 V	20%	56289	C023B101F103M
C36	110126	CAP	TANTA	6.8 MFD	35 V	20%	05397	T368B685M035AS
C37	100017	CAP	CERAM	.01 MFD	100 V	20%	56289	C023B101F103M
C38	100017	CAP	CERAM	.01 MFD	100 V	20%	56289	C023B101F103M

401618 – Assy., PCB, RMS CONVERTER continued

REF DES	RACAL-DANA P/N	DESCRIPTION	FSC	MANU P/N
C39	110162	CAP TANTA .33 MFD 35 V 5%	05397	T368A334J035AB
C40	110162	CAP TANTA .33 MFD 35 V 5%	05397	T368A334J035AB
CR1	220022	DIODE SILICO, ZENER 1N965B	81349	1N965B
CR2	210035	DIODE HOT CARRIER HP5082-2810	50434	HP5082-2810
CR3	210035	DIODE HOT CARRIER HP5082-2810	50434	HP5082-2810
K1	310078	RELAY REED 28 V	15636	R2690-3
K2	310078	RELAY REED 28 V	15636	R2690-3
K3	310078	RELAY REED 28 V	15636	R2690-3
K4	310078	RELAY REED 28 V	15636	R2690-3
Q1	200068	TRANS PNP 2N4250	80131	2N4250
Q2	403865	MATCHED LOG TRANSISTOR ASSY	21793	403865
Q3	403865	MATCHED LOG TRANSISTOR ASSY	21793	403865
Q4	200201	TRANS DUAL NPN	21793	200201
Q5	200199	TRANS FET FM1302	27014	FM1302
Q6	200068	TRANS PNP 2N4250	80131	2N4250
Q7	200200	TRANS NPN 200200	21793	200200
Q8	200264	TRANS SILICO DUAL PNP MP351		MP351
Q9	200200	TRANS NPN 200200	21793	200200
Q11	200197	TRANS SILICO NPN MPS-H10	04713	MPS-H10
Q12	200197	TRANS SILICO NPN MPS-H10	04713	MPS-H10
Q13	200200	TRANS NPN 200200	21793	200200
Q14	200200	TRANS NPN 200200	21793	200200
Q15	200220	TRANS DUAL 200220	21793	200220
Q16	200068	TRANS PNP 2N4250	80131	2N4250
Q17	200136	TRANS SILICO NPN 2N5963	81349	2N5963
R1	020667	RES WW 100 K .1% .15W	22045	J110
R2	000104	RES CARBON 100 K 5% 1/4W	81349	RC07GF104J
R3	403865	MATCHED LOG TRANSISTOR ASSY	21793	403865
R4	010618	RES METAL 200 K .25% 1/10W	81349	RN55C2003C
R5	010536	RES METAL 100 K 1% 1/10W	81349	RN55C1003F
R6	010542	RES METAL 100 K 1% 1/10W	81349	RN55E1003F
R7	000183	RES CARBON 18 K 5% 1/4W	81349	RC07GF183J
R8	000101	RES CARBON 100 OHM 5% 1/4W	81349	RC07GF101J
R9	000682	RES CARBON 6.8 K 5% 1/4W	81349	RC07GF682J
R10	010496	RES METAL 1 M 1% 1/8W	81349	RN60D1004F
R11	000104	RES CARBON 100 K 5% 1/4W	81349	RC07GF104J

401618 – Assy., PCB, RMS CONVERTER continued

REF DES	RACAL-DANA P/N	DESCRIPTION				FSC	MANU P/N
R12	001737	RES	CARBON	FSV	5% 1/4W	21793	001737
R13	010721	RES	METAL	DIAC, MATCHED SET		21793	010721
R14	000242	RES	CARBON	2.4 K	5% 1/4W	81349	RC07GF242J
R15	010721	RES	METAL	DIAC, MATCHED SET		21793	010721
R16	010542	RES	METAL	100 K	1% 1/10W	81349	RN55E1003F
R17	010611	RES	METAL	52.3 K	1% 1/10W	81349	RN55C5232F
R18	000392	RES	CARBON	3.9 K	5% 1/4W	81349	RC07GF392J
R19	010621	RES	METAL	49.9 K	1% 1/10W	81349	RN55C4992F
R20	000103	RES	CARBON	10 K	5% 1/4W	81349	RC07GF103J
R21	010533	RES	METAL	28.7 K	1% 1/10W	81349	RN55C2872F
R22	000476	RES	CARBON	47 M	5% 1/4W	81349	RC07GF476J
R23	000512	RES	CARBON	5.1 K	5% 1/4W	81349	RC07GF512J
R24	000107	RES	CARBON	100 M	5% 1/4W	81349	RC07GF107J
R25	403865	MATCHED LOG TRANSISTOR ASSY				21793	403865
R26	000681	RES	CARBON	680 OHM	5% 1/4W	81349	RC07GF681J
R27	000101	RES	CARBON	100 OHM	5% 1/4W	81349	RC07GF101J
R28	000123	RES	CARBON	12 K	5% 1/4W	81349	RC07GF123J
R29	000272	RES	CARBON	2.7 K	5% 1/4W	81349	RC07GF272J
R30	000101	RES	CARBON	100 OHM	5% 1/4W	81349	RC07GF101J
R31	010684	RES	METAL	487 OHM	1% 1/10W	81349	RN55E4870F
R32	000105	RES	CARBON	1 M	5% 1/4W	81349	RC07GF105J
R33	010684	RES	METAL	487 OHM	1% 1/10W	81349	RN55E4870F
R34	010721	RES	METAL	DIAC, MATCHED SET		21793	010721
R35	000820	RES	CARBON	82 OHM	5% 1/4W	81349	RC07GF820J
R36	010721	RES	METAL	DIAC, MATCHED SET		21793	010721
R37	001737	RES	CARBON	FSV	5% 1/4W	21793	001737
R38	001737	RES	CARBON	FSV	5% 1/4W	21793	001737
R39	010654	RES	METAL	20 K	.05%	18612	V53-1
R40	010586	RES	METAL	5 K	.02%	18612	V53-1M
R41	001737	RES	CARBON	FSV	5% 1/4W	21793	001737
R42	000101	RES	CARBON	100 OHM	5% 1/4W	81349	RC07GF101J
R43	010721	RES	METAL	DIAC, MATCHED SET		21793	010721
R44	010720	RES	METAL	9.09 K	.25% 1/10W	81349	RN55C9091C
R45	040227	POT	CERMET	200 OHM	10% 3/4W	73138	89PR200
R46	010654	RES	METAL	20 K	.05%	18612	V53-1
R47	010615	RES	METAL	10 K	.02 %	18612	V53-1M
R48	001737	RES	CARBON	FSV	5% 1/4W	21793	001737
R49	001737	RES	CARBON	FSV	5% 1/4W	21793	001737
R50	000513	RES	CARBON	51 K	5% 1/4W	81349	RC07GF513J
R51	001878	RES	CARBON	FSV	5% 1/4W	21793	001878
R52	040225	POT	CERMET	50 OHM	20%	73138	89PR50

401618 – Assy., PCB, RMS CONVERTER continued

REF DES	RACAL-DANA P/N	DESCRIPTION				FSC	MANU P/N
R53	040239	POT	CERMET	1 M	20%	73138	89PR1M
R54	040231	POT	CERMET	5 K	10%	73138	89PR5K
R55	040225	POT	CERMET	50 OHM	20%	73138	89PR50
R56	000101	RES	CARBON	100 OHM	5% 1/4W	81349	RC07GF101J
R57	000470	RES	CARBON	47 OHM	5% 1/4W	81349	RC07GF470J
R58	010615	RES	METAL	10 K	.02%	18612	V53-1M
R59	010586	RES	METAL	5 K	.02%	18612	V53-1M
R60	010654	RES	METAL	20 K	.05%	18612	V53-1
R61	000184	RES	CARBON	180 K	5% 1/4W	81349	RC07GF184J
R62	040235	POT	CERMET	100 K	10% 3/4W	73138	89PR100K
R63	040225	POT	CERMET	50 OHM	20%	73138	89PR50
R64	040225	POT	CERMET	50 OHM	20%	73138	89PR50
R65	040228	POT	CERMET	500 OHM	10%	73138	89PR500
R67	040228	POT	CERMET	500 OHM	10%	73138	89PR500
R69	001737	RES	CARBON	FSV	5% 1/4W	21793	001737
R70	000514	RES	CARBON	510 K	5% 1/4W	81349	RC07GF514J
R71	040235	POT	CERMET	100 K	10% 3/4W	73138	89PR100K
R72	040232	POT	CERMET	10 K	10%	73138	89PR10K
R73	040235	POT	CERMET	100 K	10% 3/4W	73138	89PR100K
TP1	600786	POST	MACHINE APPLIED STRIP			00779	1-87022-0
TP2	600786	POST	MACHINE APPLIED STRIP			00779	1-87022-0
TP3	600786	POST	MACHINE APPLIED STRIP			00779	1-87022-0
TP4	600786	POST	MACHINE APPLIED STRIP			00779	1-87022-0
TP5	600786	POST	MACHINE APPLIED STRIP			00779	1-87022-0
U1	230563	IC	LINEAR			27014	LM340LAZ-15
U2	230562	IC	LINEAR			27014	LM320Z-15

404017 – Assy., GPIB OPTION

REF DES	RACAL-DANA P/N	DESCRIPTION	FSC	MANU P/N
U17	230523	IC - Memory - U17		SYP2316B

401623 – Assy., PCB, GPIB-IEEE-488-1975

REF DES	RACAL-DANA P/N	DESCRIPTION	FSC	MANU P/N
C1	110126	CAP TANTA 6.8 MFD 35 V 20%	05397	T368B685M035AS
C2	100017	CAP CERAM .01 MFD 100 V 20%	56289	C023B101F103M
C3	100017	CAP CERAM .01 MFD 100 V 20%	56289	C023B101F103M
C4	100017	CAP CERAM .01 MFD 100 V 20%	56289	C023B101F103M
C5	100017	CAP CERAM .01 MFD 100 V 20%	56289	C023B101F103M
C6	100017	CAP CERAM .01 MFD 100 V 20%	56289	C023B101F103M
C7	100124	CAP CERAM 330 PFD 1000 V 20%	56289	C023B102E331M
C8	100017	CAP CERAM .01 MFD 100 V 20%	56289	C023B101F103M
C9	100017	CAP CERAM .01 MFD 100 V 20%	56289	C023B101F103M
C10	100017	CAP CERAM .01 MFD 100 V 20%	56289	C023B101F103M
C11	100071	CAP CERAM .001 MFD 1000 V 20%	56289	C023B102E102M
R1	000103	RES CARBON 10 K 5% 1/4W	81349	RC07GF103J
R2	000510	RES CARBON 51 OHM 5% 1/4W	81349	RC07GF510J
R3	000510	RES CARBON 51 OHM 5% 1/4W	81349	RC07GF510J
U1	230246	INTEGRATED CIRCUIT MC3440P	04713	MC3440P
U2	230246	INTEGRATED CIRCUIT MC3440P	04713	MC3440P
U3	230246	INTEGRATED CIRCUIT MC3440P	04713	MC3440P
U4	230246	INTEGRATED CIRCUIT MC3440P	04713	MC3440P
U5	230356	INTEGRATED CIRCUIT 74LS175	27014	74LS175
U6	230356	INTEGRATED CIRCUIT 74LS175	27014	74LS175
U7	230194	INTEGRATED CIRCUIT SN74LS74N	01295	SN74LS74N
U8	230368	INTEGRATED CIRCUIT 74LS138	27014	74LS138
U9	230194	INTEGRATED CIRCUIT SN74LS74N	01295	SN74LS74N
U10	230194	INTEGRATED CIRCUIT SN74LS74N	01295	SN74LS74N
U11	230193	INTEGRATED CIRCUIT SN74LS00N	01295	SN74LS00N
U12	230193	INTEGRATED CIRCUIT SN74LS00N	01295	SN74LS00N
U13	230368	INTEGRATED CIRCUIT 74LS138	27014	74LS138
U14	230356	INTEGRATED CIRCUIT 74LS175	27014	74LS175
U15	230382	INTEGRATED CIRCUIT 74LS161AN	27014	76LS161AN
U16	230382	INTEGRATED CIRCUIT 74LS161AN	27014	76LS161AN
U17	230330	INTEGRATED CIRCUIT 74LS367	01295	74LS367
U18	230381	INTEGRATED CIRCUIT 74LS136J	27014	74LS136J
U19	230359	INTEGRATED CIRCUIT DM74LS151N	27014	DM74LS151N
U20	230330	INTEGRATED CIRCUIT 74LS367	01295	74LS367
U21	230330	INTEGRATED CIRCUIT 74LS367	01295	74LS367
U22	230330	INTEGRATED CIRCUIT 74LS367	01295	74LS367
U23	230194	INTEGRATED CIRCUIT SN74LS74N	01295	SN74LS74N
U24	230194	INTEGRATED CIRCUIT SN74LS74N	01295	SN74LS74N
U25	230381	INTEGRATED CIRCUIT 74LS136J	27014	74LS136J
U26	230248	INTEGRATED CIRCUIT SN74LS10N	01295	SN74LS10N
U27	230368	INTEGRATED CIRCUIT 74LS138	27014	74LS138
U28	230359	INTEGRATED CIRCUIT DM74LS151N	27014	DN174LS151N
U29	230359	INTEGRATED CIRCUIT DM74LS151N	27014	DN174LS151N
U30	230372	INTEGRATED CIRCUIT DM74LS287	27014	DM74LS287
U31	230387	INTEGRATED PROM "U31" HM7611	34371	HM7611
Z1	080020	RES CERMET 10 K NETWORK 8P.7R 2%	11236	750-81-R10KΩ
Z2	080020	RES CERMET 10 K NETWORK 8P.7R 2%	11236	750-81-R10KΩ

404018 – Assy., CABLE, GPIB

REF DES	RACAL-DANA P/N	DESCRIPTION	FSC	MANU P/N
J213	600835	CONN 24 P	00779	2-552273-1

401616 – Assy., PCB, PRE-AMPLIFIER

REF DES	RACAL-DANA P/N	DESCRIPTION					FSC	MANU P/N
AR1	230379	IC	H.V. OP AMP		MC1436G		04713	MC1436G
C1	100027	CAP	CERAM	.1 MFD	100 V	20%	72982	845-000-X5V0104Z
C2	110137	CAP	TANTA	.47 MFD	35 V	20%	05397	T368A474M035AS
C3	120134	CAP	MYLAR	1 MFD	200 V	10%	19396	MF1200LL
C4	120026	CAP	MYLAR	.47 MFD	100 V	10%	27556	SA2B474K
C5	101175	CAP	CERAM	220 PFD	500 V	10%	71471	SCD1X5F
C6	101175	CAP	CERAM	220 PFD.	500 V	10%	71471	SCD1X5F
C7	100027	CAP	CERAM	.1 MFD	100 V	20%	72982	845-000-X5V0104Z
C8	100027	CAP	CERAM	.1 MFD	100 V	20%	72982	845-000-X5V0104Z
C9	100027	CAP	CERAM	.1 MFD	100 V	20%	72982	845-000-X5V0104Z
C10	100027	CAP	CERAM	.1 MFD	100 V	20%	72982	845-000-X5V0104Z
C11	110020	CAP	TANTA	10 MFD	35 V	10%	05397	T310C106K035AS
C12	120348	CAP	POLY	1.5 MFD	200 V	5%	27556	GA2C155J
C13	100017	CAP	CERAM	.01 MFD	100 V	20%	56289	C023B101F103M
C14	100017	CAP	CERAM	.01 MFD	100 V	20%	56289	C023B101F103M
C15	120291	CAP	MYLAR	.27 MFD	100 V	20%	73445	C281AH/A270K
C16	130042	CAP	GLASS	2.7 PFD	500 V	10%	14674	CYFM10C2R7
C17	120348	CAP	POLY	1.5 MFD	200 V	5%	27556	GA2C155J
C18	110145	CAP	CERAM	100 PFD	500 V	10%	04222	TCD-DI-1N5600-100
CR1	211083	DIODE	SILICO		1N916B		81349	1N916B
CR2	211083	DIODE	SILICO		1N916B		81349	1N916B
CR3	211083	DIODE	SILICO		1N916B		81349	1N916B
CR4	220049	DIODE	ZENER		1N957B	5%	81349	1N957B
K1	310112	RELAY		28 V			26806	AZ421-467-204
Q1	200204	TRANS	DUAL		2N3957		81349	2N3957
Q2	200200	TRANS		NPN	200200		21793	200200
Q3	200200	TRANS		NPN	200200		21793	200200
Q4	200206	TRANS	FET		3N138		80131	3N138
Q5	200206	TRANS	FET		3N138		80131	3N138
Q6	200068	TRANS		PNP	2N4250		80131	2N4250
Q7	200253	TRANS	SILICO	NPN	MPS-A18		04713	MPS-A18
Q8	200200	TRANS		NPN	200200		21793	200200
Q9	200200	TRANS		NPN	200200		21793	200200
R1	000101	RES	CARBON	100 OHM		5% 1/4W	81349	RC07GF101J
R2	000103	RES	CARBON	10 K		5% 1/4W	81349	RC07GF103J
R3	000105	RES	CARBON	1 M		5% 1/4W	81349	RC07GF105J

401616 – Assy., PCB, PRE-AMPLIFIER continued

REF DES	RACAL-DANA P/N	DESCRIPTION				FSC	MANU P/N
R4	000912	RES	CARBON	9.1 K	5% 1/4W	81349	RC07GF912J
R5	000825	RES	CARBON	8.2 M	5% 1/4W	81349	RC07GF825J
R6	000825	RES	CARBON	8.2 M	5% 1/4W	81349	RC07GF825J
R7	000101	RES	CARBON	100 OHM	5% 1/4W	81349	RC07GF101J
R8	000333	RES	CARBON	33 K	5% 1/4W	81349	RC07GF333J
R9	000334	RES	CARBON	330 K	5% 1/4W	81349	RC07GF334J
R10	000681	RES	CARBON	680 OHM	5% 1/4W	81349	RC07GF681J
R11	000223	RES	CARBON	22 K	5% 1/4W	81349	RC07GF223J
R12	000105	RES	CARBON	1 M	5% 1/4W	81349	RC07GF105J
R13	000105	RES	CARBON	1 M	5% 1/4W	81349	RC07GF105J
R14	020665	RES	WW	9.9 K	1% 3W	91637	RS-2B
R15	020665	RES	WW	9.9 K	1% 3W	91637	RS-2B
R16	000680	RES	CARBON	68 OHM	5% 1/4W	81349	RC07GF680J
R17	000104	RES	CARBON	100 K	5% 1/4W	81349	RC07GF104J
R18	000104	RES	CARBON	100 K	5% 1/4W	81349	RC07GF104J
R19	000473	RES	CARBON	47 K	5% 1/4W	81349	RC07GF473J
R22	000912	RES	CARBON	9.1 K	5% 1/4W	81349	RC07GF912J
R26	000473	RES	CARBON	47 K	5% 1/4W	81349	RC07GF473J
R27	040239	POT	CERMET	1 M	20%	73138	89PR1M
R28	020665	RES	WW	9.9 K	1% 3W	91637	RS-2B
R29	020665	RES	WW	9.9 K	1% 3W	91637	RS-2B
R30	000513	RES	CARBON	51 K	5% 1/4W	81349	RC07GF513J
R31	000152	RES	CARBON	1.5 K	5% 1/4W	81349	RC07GF152J

401622 – Assy., PCB, FAST DIGITIZER

REF DES	RACAL-DANA P/N	DESCRIPTION					FSC	MANU P/N
C1	101175	CAP	CERAM	220 PFD	500 V	10%	71471	SCD1X5F
C2	100019	CAP	CERAM	.002 MFD	1000 V	10%	56289	C023B102F202M
C3	101175	CAP	CERAM	220 PFD	500 V	10%	71471	SCD1X5F
C4	100017	CAP	CERAM	.01 MFD	100 V	20%	56289	C023B101F103M
C5	100017	CAP	CERAM	.01 MFD	100 V	20%	56289	C023B101F103M
C6	101175	CAP	CERAM	220 PFD	500 V	10%	71471	SCD1X5F
C7	110126	CAP	TANTA	6.8 MFD	35 V	20%	05397	T368B685M035AS
C8	110126	CAP	TANTA	6.8 MFD	35 V	20%	05397	T368B685M035AS
C9	101175	CAP	CERAM	220 PFD	500 V	10%	71471	SCD1X5F
C10	110126	CAP	TANTA	6.8 MFD	35 V	20%	05397	T368B685M035AS
C11	110126	CAP	TANTA	6.8 MFD	35 V	20%	05397	T368B685M035AS
C12	101175	CAP	CERAM	220 PFD	500 V	10%	71471	SCD1X5F
C13	100017	CAP	CERAM	.01 MFD	100 V	20%	56289	C023B101F103M
C14	100017	CAP	CERAM	.01 MFD	100 V	20%	56289	C023B101F103M
C15	110129	CAP	TANTA	.1 MFD	35 V	20%	05397	T368A104M035AS
C16	100017	CAP	CERAM	.01 MFD	100 V	20%	56289	C023B101F103M
CR1	211083	DIODE	SILICO		IN916B		81349	IN916B
CR2	211083	DIODE	SILICO		IN916B		81349	IN916B
Q1	200037	TRANS	SILICO	NPN	2N3646		80131	2N3646
Q2	200099	TRANS		PNP	2N4258		81349	2N4258
Q3	200037	TRANS	SILICO	NPN	2N3646		80131	2N3646
Q4	200037	TRANS	SILICO	NPN	2N3646		80131	2N3646
R1	000203	RES	CARBON	20 K		5% 1/4W	81349	RC07GF203J
R2	000202	RES	CARBON	2 K		5% 1/4W	81349	RC07GF202J
R3	000202	RES	CARBON	2 K		5% 1/4W	81349	RC07GF202J
R4	000103	RES	CARBON	10 K		5% 1/4W	81349	RC07GF103J
R5	000242	RES	CARBON	2.4 K		5% 1/4W	81349	RC07GF242J
R6	000102	RES	CARBON	1 K		5% 1/4W	81349	RC07GF102J
R7	000103	RES	CARBON	10 K		5% 1/4W	81349	RC07GF103J
R8	000271	RES	CARBON	270 OHM		5% 1/4W	81349	RC07GF271J
R9	010650	RES	METAL	1 M		1% 1/10W	81349	RN55E1004F
R10	000103	RES	CARBON	10 K		5% 1/4W	81349	RC07GF103J
R11	000202	RES	CARBON	2 K		5% 1/4W	81349	RC07GF202J
R12	010951	RES	METAL	365 K		1% 1/10W	81349	RN55C3653F
R13	000103	RES	CARBON	10 K		5% 1/4W	81349	RC07GF103J
R14	000103	RES	CARBON	10 K		5% 1/4W	81349	RC07GF103J
R15	000181	RES	CARBON	180 OHM		5% 1/4W	81349	RC07GF181J
R16	000200	RES	CARBON	20 OHM		5% 1/4W	81349	RC07GF200J
R17	000302	RES	CARBON	3 K		5% 1/4W	81349	RC07GF302J

401622, Assy., PCB, FAST DIGITIZER *continued*

REF DES	RACAL-DANA P/N	DESCRIPTION	FSC	MANU P/N
R18	000103	RES CARBON 10 K 5% 1/4W	81349	RC07GF103J
R19	000202	RES CARBON 2 K 5% 1/4W	81349	RC07GF202J
R20	040210	POT CERMET 100 K 20% 1W	11237	360S104B
R21	040210	POT CERMET 100 K 20% 1W	11237	360S104B
R22	010631	RES METAL 10.2 K 1% 1/10W	81349	RN55C1022F
T1	300087	TRANSFORMER PULSE	21793	300087
U1	230389	INTEGRATED CIRCUIT ADC-80AG-12	13919	ADC-80AG-12
U2	230237	INTEGRATED CIRCUIT SN74LS123N	01295	SN74LS123N
U3	250006	HIGH SPEED OPTICAL ISOLATOR HP5082-4351	50434	HP5082-4351
U4	230330	INTEGRATED CIRCUIT 74LS367	01295	74LS367
U5	230330	INTEGRATED CIRCUIT 74LS367	01295	74LS367
U6	230330	INTEGRATED CIRCUIT 74LS367	01295	74LS367
U7	230237	INTEGRATED CIRCUIT SN74LS123N	01295	SN74LS123N
U8	230193	INTEGRATED CIRCUIT SN74LS00N	01295	SN74LS00N
U9	230192	INTEGRATED CIRCUIT 14 DIP, INVERTER	01295	SN74LS05N
U10	250006	HIGH SPEED OPTICAL ISOLATOR HP5082-4351	50434	HP5082-4351
U11	230234	INTEGRATED CIRCUIT SN74LS04N	01295	SN74LS04N
U12	230510	INTEGRATED CIRCUIT 74LS164		74LS164
U13	230234	INTEGRATED CIRCUIT SN74LS04N	01295	SN74LS04N
U14	230510	INTEGRATED CIRCUIT 74LS164		74LS164
U15	230193	INTEGRATED CIRCUIT SN74LS00N	01295	SN74LS00N

404022 – Assy., CABLE, FAST DIGITIZER

REF DES	RACAL-DANA P/N	DESCRIPTION	FSC	MANU P/N
J208	600167	CONN 25 S	71785	DB-25S

401606 – Assy., PCB, RATIO SWITCHING

REF DES	RACAL-DANA P/N	DESCRIPTION					FSC	MANU P/N
C1	110140	CAP	TANTA	47 MFD	6 V	20%	05397	T368B476M006AS
C2	120308	CAP	POLY	.047 MFD	250 V	10%	73445	C280MAE/A47K
CR1	211083	DIODE	SILICO		1N916B		81349	1N916B
CR2	220015	DIODE	SILICO, ZENER		1N967B		81349	1N967B
CR3	220015	DIODE	SILICO, ZENER		1N967B		81349	1N967B
CR4	220015	DIODE	SILICO, ZENER		1N967B		81349	1N967B
CR5	220015	DIODE	SILICO, ZENER		1N967B		81349	1N967B
K1	310112	RELAY			28 V		26806	AZ421-467-204
Q1	200179	TRANS	FET		KE4391		27014	KE4391
Q2	200252	TRANS	J-FET		J174		27014	J174
Q3	200200	TRANS		NPN	200200		21793	200200
Q4	200200	TRANS		NPN	200200		21793	200200
R1	020715	RES	WW	1.111 K		.1% .05W	22045	J90
R2	000104	RES	CARBON	100 K		5% 1/4W	81349	RC07GF104J
R3	000104	RES	CARBON	100 K		5% 1/4W	81349	RC07GF104J
R4	000153	RES	CARBON	15 K		5% 1/4W	81349	RC07GF153J
R5	000105	RES	CARBON	. 1 M		5% 1/4W	81349	RC07GF105J
R6	000336	RES	CARBON	33 M		5% 1/4W	81349	RC07GF336J
R7	030015	RES	WW	100 K		1% 10W	21551	M100
R8	030015	RES	WW	100 K		1% 10W	21551	M100

401620 – Assy., PCB, SCALING AMPLIFIER

REF DES	RACAL-DANA P/N	DESCRIPTION					FSC	MANU P/N
B1	920563	BEADS	SHIELDING				02114	56-59065/4B
B2	920563	BEADS	SHIELDING				02114	56-59065/4B
C1	110141	CAP	TANTA	22 MFD	15 V	20%	05397	T368B226M015AS
C2	100017	CAP	CERAM	.01 MFD	100 V	20%	56289	C023B101F103M
C3	100100	CAP	CERAM	FSV			21793	100100
C4	100100	CAP	CERAM	FSV			21793	100100
C5	100017	CAP	CERAM	.01 MFD	100 V	20%	56289	C023B101F103M
C6	110126	CAP	TANTA	6.8 MFD	35 V	20%	05397	T368B685M035AS
C7	110140	CAP	TANTA	47 MFD	6 V	20%	05397	T368B476M006AS
C8	120274	CAP	POLY	87 PFD	500/630 V	2.5%	08257	KSO Series
C9	130115	CAP	MICA	346 PFD	500 V	2%	72136	DM15F3460G0
C10	110162	CAP	TANTA	.33 MFD	35 V	5%	05397	T368A334J035AS
C11	110162	CAP	TANTA	.33 MFD	35 V	5%	05397	T368A334J035AS
C12	120275	CAP	POLY	1000 PFD	500/630 V	2.5%	08257	KSO Series
C13	100017	CAP	CERAM	.01 MFD	100 V	20%	56289	C023B101F103M
C14	100017	CAP	CERAM	.01 MFD	100 V	20%	56289	C023B101F103M
C15	100017	CAP	CERAM	.01 MFD	100 V	20%	56289	C023B101F103M
C16	100100	CAP	CERAM	FSV			21793	100100
C17	120280	CAP	MYLAR	.22 MFD	1000 V	10%	27556	ZA2J224K
C18	100017	CAP	CERAM	.01 MFD	100 V	20%	56289	C023B101F103M
C19	100097	CAP	CERAM	12 PFD	1000 V	5%	56289	C030B102E120J
C20	100017	CAP	CERAM	.01 MFD	100 V	20%	56289	C023B101F103M
C21	130116	CAP	MICA	3900 PFD	500 V	2%	72136	DM19F392G0
C22	110129	CAP	TANTA	.1 MFD	35 V	20%	05397	T368A104M035AS
C23	110129	CAP	TANTA	.1 MFD	35 V	20%	05397	T368A104M035AS
C24	110126	CAP	TANTA	6.8 MFD	35 V	20%	05397	T368B685M035AS
C25	100017	CAP	CERAM	.01 MFD	100 V	20%	56289	C023B101F103M
C26	100100	CAP	CERAM	FSV			21793	100100
C27	130124	CAP	TRIMMER	1.2-10 PFD	250 V		52763	R-TRIKO-122-09SD
C28	130123	CAP	TRIMMER	1-3 PFD	250 V		52763	R-TRIKO-122-09SD
C29	110126	CAP	TANTA	6.8 MFD	35 V	20%	05397	T368B685M035AS
C30	100061	CAP	CERAM	39 PFD	1000 V	5%	56289	C030B102G390J
C31	100050	CAP	CERAM	2.2 PFD	1000 V	5%	56289	C030B102S2R2D
C32	110126	CAP	TANTA	6.8 MFD	35 V	20%	05397	T368B685M035AS
C33	110126	CAP	TANTA	6.8 MFD	35 V	20%	05397	T368B685M035AS
C34	101174	CAP	CERAM	.001 MFD	500 V	10%	04222	SCD-DI-2X5F-1000
C35	100077	CAP	GLASS	7.5 PFD	500 V	5%	95275	VY10CA7R5JA
C36	130125	CAP	PORCE	.8-10 PFD	250 V		91293	JMC2951
C37	100075	CAP	CERAM	10 PFD	1000 V	5%	56289	C030B102E100J
C38	130164	CAP	PORCE	5.6 PFD	500 V	5%	95275	VY10CA5R6J

401620 – Assy., PCB, SCALING AMPLIFIER continued

REF DES	RACAL-DANA P/N	DESCRIPTION					FSC	MANU P/N
C39	100085	CAP	CERAM	6.8 PFD	1000 V	5%	56289	C030B102E6R8D
C40	130125	CAP	PROCE	.8-10 PFD	250 V		91293	JMC2951
C41	110126	CAP	TANTA	6.8 MFD	35 V	20%	05397	T368B685M035AS
C42	130127	CAP	TRIMMER	10-40 PFD			52763	10S-TRIKO-24N750
C43	100081	CAP	CERAM	4.7 PFD	1000 V	5%	56289	C030B102E4R7D
C44	110140	CAP	TANTA	47 MFD	6 V	20%	05397	T368B476M006AS
C45	110140	CAP	TANTA	47 MFD	6 V	20%	05397	T368B476M006AS
C46	110140	CAP	TANTA	47 MFD	6 V	20%	05397	T368B476M006AS
C47	100017	CAP	CERAM	.01 MFD	100 V	20%	56289	C023B101F103M
C48	100017	CAP	CERAM	.01 MFD	100 V	20%	56289	C023B101F103M
C49	100017	CAP	CERAM	.01 MFD	100 V	20%	56289	C023B101F103M
CR1	211083	TRANS	SILICO		1N916B		81349	1N916B
CR2	220004	DIODE	SILICO, ZENER		1N961B		81349	1N961B
CR3	210017	DIODE	MATCHED PAIR		W/CR4		21793	210017
CR4	210017	DIODE	MATCHED PAIR		W/CR3		21793	210017
CR5	220086	DIODE	ZENER	1N748A	3.9 V	5%	04713	1N748A
CR6	220004	DIODE	SILICO, ZENER		1N961B		81349	1N961B
CR7	220038	DIODE	ZENER	1N959B	8.2 V	5%	81349	1N959B
CR8	210017	DIODE	MATCHED PAIR		W/CR9		21793	210017
CR9	210017	DIODE	MATCHED PAIR		W/CR8		21793	210017
CR10	200197	TRANS	SILICO	NPN	MPS-H10		04713	MPS-H10
CR11	200197	TRANS	SILICO	NPN	MPS-H10		04713	MPS-H10
K1	310078	RELAY	REED		28 V		15636	R2690-3
K2	310078	RELAY	REED		28 V		15636	R2690-3
K3	310078	RELAY	REED		28 V		15636	R2690-3
L1	310068	CHOKE	RF	1μH		10%	99800	1537-12
Q1	200197	TRANS	SILICO	NPN	MPS-H10		04713	MPS-H10
Q2	200178	TRANS		PNP	2N5910		81349	2N5910
Q3	200197	TRANS	SILICO	NPN	MPS-H10		04713	MPS-H10
Q4	200197	TRANS	SILICO	NPN	MPS-H10		04713	MPS-H10
Q5	200178	TRANS		PNP	2N5910		81349	2N5910
Q6	200197	TRANS	SILICO	NPN	MPS-H10		04713	MPS-H10
Q7	200197	TRANS	SILICO	NPN	MPS-H10		04713	MPS-H10
Q8	200197	TRANS	SILICO	NPN	MPS-H10		04713	MPS-H10
Q9	200161	TRANS	DUAL	FET	2N5454		27014	2N5454
Q10	200197	TRANS	SILICO	NPN	MPS-H10		04713	MPS-H10
R1	000473	RES	CARBON	47 K		5% 1/4W	81349	RC07GF473J
R2	010721	RES	METAL	DIAC, MATCHED SET			21793	010721
R3	000682	RES	CARBON	6.8 K		5% 1/4W	81349	RC07GF682J

401620 – Assy., PCB, SCALING AMPLIFIER continued

REF DES	RACAL-DANA P/N	DESCRIPTION				FSC	MANU P/N
R4	000472	RES	CARBON	4.7 K	5% 1/4W	81349	RC07GF472J
R5	000680	RES	CARBON	68 OHM	5% 1/4W	81349	RC07GF680J
R6	000621	RES	CARBON	620 OHM	5% 1/4W	81349	RC07GF621J
R7	000223	RES	CARBON	22 K	5% 1/4W	81349	RC07GF223J
R8	000152	RES	CARBON	1.5 K	5% 1/4W	81349	RC07GF152J
R9	010798	RES	METAL	82.5 OHM	1% 1/10W	81349	RN55C82R5F
R10	010721	RES	METAL	DIAC, MATCHED SET		21793	010721
R11	000301	RES	CARBON	300 OHM	5% 1/4W	81349	RC07GF301J
R12	000123	RES	CARBON	12 K	5% 1/4W	81349	RC07GF123J
R13	010583	RES	METAL	182 OHM	1% 1/10W	81349	RN55C1820F
R14	010583	RES	METAL	182 OHM	1% 1/10W	81349	RN55C1820F
R15	040258	POT	CERMET	100 OHM	20% 1/2W	73138	72XW100
R16	000680	RES	CARBON	68 OHM	5% 1/4W	81349	RC07GF680J
R17	010536	RES	METAL	100 K	1% 1/10W	81349	RN55C1003F
R18	000101	RES	CARBON	100 OHM	5% 1/4W	81349	RC07GF101J
R19	000160	RES	CARBON	16 OHM	5% 1/4W	81349	RC07GF160J
R20	010720	RES	METAL	9.09 K	.25% 1/10W	81349	RN55C9091C
R21	010813	RES	METAL	7.87 K	.1% 1/10W	81349	RN55C7871F
R22	010827	RES	METAL	8.25 K	1% 1/10W	81349	RN55C8251F
R23	000202	RES	CARBON	2 K	5% 1/4W	81349	RC07GF202J
R24	000102	RES	CARBON	1 K	5% 1/4W	81349	RC07GF102J
R25	000510	RES	CARBON	51 OHM	5% 1/4W	81349	RC07GF510J
R26	010536	RES	METAL	100 K	1% 1/10W	81349	RN55C1003F
R27	000510	RES	CARBON	51 OHM	5% 1/4W	81349	RC07GF510J
R28	000241	RES	CARBON	240 OHM	5% 1/4W	81349	RC07GF241J
R29	040228	POT	CERMET	500 OHM	10%	73138	89PR500
R30	040225	POT	CERMET	50 OHM	20%	73138	89PR50
R31	040229	POT	CERMET	1 K	10% 3/4W	73138	89PR1K
R32	010721	RES	METAL	DIAC, MATCHED SET		21793	010721
R33	010721	RES	METAL	DIAC, MATCHED SET		21793	010721
R34	010721	RES	METAL	DIAC, MATCHED SET		21793	010721
R35	000163	RES	CC	16 K	5% 1/4W	81349	RC07GF163J
R36	040239	POT	CERMET	1 M	20%	73138	89PR1M
R37	000241	RES	CARBON	240 OHM	5% 1/4W	81349	RC07GF241J
R38	000101	RES	CARBON	100 OHM	5% 1/4W	81349	RC07GF101J
R39	041179	POT	WW	5 K		02111	50-1-1-502
R40	000103	RES	CARBON	10 K	5% 1/4W	81349	RC07GF103J
U1	230322	IC		MC78L18ACP		04713	MC78L18ACP
U2	230323	IC		MC79L18ACP		04713	MC79L18ACP

404059 – Assy., SAMPLE AND HOLD DIGITIZER, Option 03

REF DES	RACAL-DANA P/N	DESCRIPTION	FSC	MANU P/N
P208	600166	CONN 25 P	71785	DB-25P

401641 – Assy., SAMPLE AND HOLD DIGITIZER

REF DES	RACAL-DANA P/N	DESCRIPTION	FSC	MANU P/N
AR1	230479	AMPLIFIER BUFFER LH033C	27014	LH033C
AR2	230479	AMPLIFIER BUFFER LH033C	27014	LH033C
C1	110126	CAP TANTA 6.8 MFD 35 V 20%	05397	T368B685M035AS
C2	110126	CAP TANTA 6.8 MFD 35 V 20%	05397	T368B685M035AS
C3	110126	CAP TANTA 6.8 MFD 35 V 20%	05397	T368B685M035AS
C4	100019	CAP CERAM .002 MFD 1000 V 10%	56289	C023B102F202M
C5	101175	CAP CERAM 220 PFD 500 V 10%	71471	SCD1X5F
C6	101175	CAP CERAM 220 PFD 500 V 10%	71471	SCD1X5F
C7	101175	CAP CERAM 220 PFD 500 V 10%	71471	SCD1X5F
C8	110126	CAP TANTA 6.8 MFD 35 V 20%	05397	T368B685M035AS
C9	100017	CAP CERAM .01 MFD 100 V 20%	56289	C023B101F103M
C10	110126	CAP TANTA 6.8 MFD 35 V 20%	05397	T368B685M035AS
C11	100017	CAP CERAM .01 MFD 100 V 20%	56289	C023B101F103M
C12	100017	CAP CERAM .01 MFD 100 V 20%	56289	C023B101F103M
C13	101175	CAP CERAM 220 PFD 500 V 10%	71471	SCD1X5F
C14	100017	CAP CERAM .01 MFD 100 V 20%	56289	C023B101F103M
C15	100062	CAP CERAM .01 MFD 100 V 10%	72982	8121-100-W5R0-103K
C16	100123	CAP CERAM 3.0 ± .5 PFD 1000 V 5%	56289	C030B102S3R0D
C17	100062	CAP CERAM .01 MFD 100 V 10%	72982	8121-100-W5R0-103K
C19	100107	CAP CERAM 470 PFD 1000 V 20%	02799	CCD-471
C20	100017	CAP CERAM .01 MFD 100 V 20%	56289	C023B101F103M
C21	100017	CAP CERAM .01 MFD 100 V 20%	56289	C023B101F103M
C22	120275	CAP POLY 1000 PFD 500/630 V 2.5%	08257	KSO Series
C23	100017	CAP CERAM .01 MFD 100 V 20%	56289	C023B101F103M
C24	100062	CAP CERAM .01 MFD 100 V 10%	72982	8121-100-W5R0-103K
C25	100062	CAP CERAM .01 MFD 100 V 10%	72982	8121-100-W5R0-103K
CR1	211083	DIODE SILICO 1N916B	81349	1N916B
CR2	211083	DIODE SILICO 1N916B	81349	1N916B
CR3	211083	DIODE SILICO 1N916B	81349	1N916B
CR4	211083	DIODE SILICO 1N916B	81349	1N916B
J208	600167	CONN 25S	71785	DB-25502E102M
K1	310142	RELAY, REED FORM 2C	15636	RA30322051
OCI1	250006	HI SPEED OPTICAL ISOLATOR	50434	HP5082-4351
OCI2	250008	FAST TTL OPTICALLY COUPLED GATE	50434	6N137 (HP5082-4360)
OCI3	250008	FAST TTL OPTICALLY COUPLED GATE	50434	6N137 (HP5082-4360)
OCI4	250008	FAST TTL OPTICALLY COUPLED GATE	50434	6N137 (HP5082-4360)

401641 – Assy., SAMPLE AND HOLD DIGITIZER

REF DES	RACAL-DANA P/N	DESCRIPTION	FSC	MANU P/N
Q1	200178	TRANS PNP	81349	2N5910
Q2	200097	TRANS NPN	81349	2N3643
Q3	200200	TRANS NPN	21793	200200
Q4	200097	TRANS NPN	81349	2N3643
Q5	200200	TRANS NPN	21793	200200
Q6	200262	TRANS N-CHANNEL J-FET	27014	PN4392
Q7	200262	TRANS N-CHANNEL J-FET	27014	PN4392
R1	000562	RES CARBON 5.6 K 5% 1/4W	81349	RC07GF562J
R2	000102	RES CARBON 1 K 5% 1/4W	81349	RC07GF102J
R3	000202	RES CARBON 2 K 5% 1/4W	81349	RC07GF202J
R4	000180	RES CARBON 18 OHM 5% 1/4W	81349	RC07GF180J
R5	000180	RES CARBON 18 OHM 5% 1/4W	81349	RC07GF180J
R6	000103	RES CARBON 10 K 5% 1/4W	81349	RC07GF103J
R7	000472	RES CARBON 4.7 K 5% 1/4W	81349	RC07GF472J
R8	000302	RES CARBON 3 K 5% 1/4W	81349	RC07GF302J
R9	000271	RES CARBON 270 OHM 5% 1/4W	81349	RC07GF271J
R10	000471	RES CARBON 470 OHM 5% 1/4W	81349	RC07GF471J
R11	000361	RES CARBON 360 OHM 5% 1/4W	81349	RC07GF361J
R12	000103	RES CARBON 10 K 5% 1/4W	81349	RC07GF103J
R13	000512	RES CARBON 5.1 K 5% 1/4W	81349	RC07GF512J
R15	000472	RES CARBON 4.7 K 5% 1/4W	81349	RC07GF472J
R16	000512	RES CARBON 5.1 K 5% 1/4W	81349	RC07GF512J
R17	000103	RES CARBON 10 K 5% 1/4W	81349	RC07GF103J
R18	000202	RES CARBON 2 K 5% 1/4W	81349	RC07GF202J
R19	000103	RES CARBON 10 K 5% 1/4W	81349	RC07GF103J
R20	000203	RES CARBON 20 K 5% 1/4W	81349	RC07GF203J
R21	000102	RES CARBON 1 K 5% 1/4W	81349	RC07GF102J
R22	010790	RES METAL 36.5 K 1% 1/10W	81349	RN55E3652F
R23	010542	RES METAL 100 K 1% 1/10W	81349	RN55E1003F
R24	040229	POT CERMET 1 K 10% 3/4W	73138	89PR1K
R25	012066	RES METAL FILM 825 K 1% 1/8W	81349	RN55E8253F
R26	040179	POT CERMET 10 K 20% 3/4W	11237	360 Series
R27	000103	RES CARBON 10 K 5% 1/4W	81349	RC07GF103J
R28	000361	RES CARBON 360 OHM 5% 1/4W	81349	RC07GF361J
R29	000511	RES CARBON 510 OHM 5% 1/4W	81349	RC07GF511J
R30	000181	RES CARBON 180 OHM 5% 1/4W	81349	RC07GF181J
R31	000302	RES CARBON 3 K 5% 1/4W	81349	RC07GF302J
R32	000103	RES CARBON 10 K 5% 1/4W	81349	RC07GF103J
R33	040235	POT CERMET 100 K 10% 3/4W	73138	89PR100K
R34	000101	RES CARBON 100 OHM 5% 1/4W	81349	RC07GF101J
R35	000101	RES CARBON 100 OHM 5% 1/4W	81349	RC07GF101J
R36	001737	RES CARBON FSV 5% 1/4W	21793	001737

401641 – Assy., SAMPLE AND HOLD DIGITIZER

REF DES	RACAL-DANA P/N	DESCRIPTION	FSC	MANU P/N
U1	230389	IC	13919	ADC-80AG-12
U2	230193	IC 14 DIP, NAND GATE	01295	SN74LS00N
U3	230330	IC	01295	74LS367
U4	230330	IC	01295	74LS367
U5	230330	IC	01295	74LS367
U6	230237	IC DUAL ONE SHOT, PLASTIC	01295	SN74LS123N
U7	230193	IC 14 DIP, NAND GATE	01295	SN74LS00N
U8	230192	IC 14 DIP, INVERTER	01295	SN74LS05N
U9	230237	IC DUAL ONE SHOT, PLASTIC	01295	SN74LS123N
U10	230234	IC 14 DIP, HEX INVERTER	01295	SN74LS04N
U11	230510	IC 8 BIT SHIFT REGISTER		74LS164
U12	230234	IC 14 DIP, HEX INVERTER	01295	SN74LS04N
U13	230510	IC 8 BIT SHIFT REGISTER		74LS164
U14	230193	IC 14 DIP, NAND GATE	01295	SN74LS00N

404034 - 50 Hz Modification
Replace existing parts with the following:

Control Logic PCB (401604)

REF DES	RACAL-DANA P/N	DESCRIPTION	FSC	MANU P/N
C10	130160	CAP MICA 330 PFD	72136	DM15 Series
C11	130163	CAP MICA 39PFD 500 V 5%	09023	CD6ED390J03
Y1	920812	CABLE ASSY,AC POWER,CRYSTAL,FUND MODE,SOLDER SEAL 20MHz	75378	H-5-W

Digitizer PCB (401609)

R13	010706	RES METAL 121K 1% 1/8W	81349	RN60D1213F
R14	010135	RES METAL 24.9K 1% 1/8W	81349	RN60D2492F

Digital Multimeter Assy. (400987)

A1	600858	CABLE ASSY AC POWER	21793	600858

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Telephone: (02) 5062767/5052686, TLX: 315697

REPAIR REQUEST FORM

To allow us to better understand your repair requests, we suggest you use the following outline and include a copy with your instrument to be sent to your local Racal-Dana repair facility.

Model Number _____ Options _____ Date _____

Serial Number _____ P. O.# _____

Company Name _____

Address _____

City _____ State _____ Zip Code _____

Contact _____ Phone Number _____

1. Describe, in detail, the problem and symptoms you are having.

_____

_____

2. If you are using your unit on the bus, please list the program strings used and the controller type, if possible.

_____

_____

3. List all input levels, and frequencies this failure occurs.

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_____

4. Indicate any repair work previously performed.

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5. Please give any additional information you feel would be beneficial in facilitating a faster repair time. (I. E., modifications, etc.)

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MP MASTER
MA29581